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ABSTRACT

This study identifies worldwide trends in environmental education (EE), and in light of these trends, suggests ways of improving EE training of primary school teachers. The study begins with a discussion of EE definitions, providing a South African definition and including a list of guiding principles for effective EE at schools/universities. The term "environmental literacy" is introduced, which describes individuals who have environmental knowledge, and whose attitudes, values, and behavior patterns reflect concern for the environment. Expressing the view that all primary teachers should be trained in EE, a training model for these teachers is proposed. The model focuses on developing environmental literacy and the didactics of effective EE (teacher-training). Eighteen key elements are identified as important for such teacher education, 8 related to learning-and-responding training and 10 related to teacher-training. These elements are used to assess four Bachelor of Primary Education (BPE) programs in the Transvaal. Although little stands in the way of universities in developing effective EE programs, the study identifies a number of problem areas in EE and concludes that none of the universities has environmental literacy as a basic aim of its BPE programs. Recommendations to these universities on possible improvements to these programs are included. (JN)

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DIRECTIONS IN ENVIRONMENTAL EDUCATION AND THEIR IMPLICATION FOR THE TRAINING OF PRIMARY SCHOOL TEACHERS IN THE TRANSVAAL : TOWARDS A SYNTHESIS

by

LYNN BOYD HURRY

Submitted in accordance with the requirements for the
degree of

DOCTOR OF EDUCATION

in the subject

DIDACTICS

at the

UNIVERSITY OF SOUTH AFRICA

PROMOTER : PROFESSOR R.M. YULE

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SUMMARY

This study begins with a discussion of Environmental Education. Various overseas definitions are discussed, and a South African definition is provided. A list of guiding principles for effective Environmental Education at schools and universities is included.

The term "Environmental Literacy" is introduced. It is used to describe someone who has environmental knowledge and whose attitudes, values and patterns of behaviour reflect a concern for the environment.

The view is expressed that all primary school teachers should be trained in Environmental Education, regardless of their areas of specialisation.

A model for training primary school teachers is proposed. This model is based on the opinions of local as well as overseas educationists. Environmental Education is an integral part of the model.

There are two aspects to be considered in the training of teachers in Environmental Education. On the one hand it is necessary to develop Environmental Literacy in teachers, and on the other the teachers need to be trained in the didactics of effective Environmental Education. The former training is referred to as "learning-and-responding", while the latter is referred to as "teacher-training".

Eighteen key elements are identified as being important for the training of teachers in Environmental Education. Eight of these relate to learning-and-responding training, while ten relate to teacher-training.

The eighteen key elements are used to assess four Bachelor of Primary Education programmes in the Transvaal. To begin with the potential influence of "The criteria for the evaluation of qualifications for employment in education" (known as "the Criteria") is discussed. Thereafter the programmes themselves are evaluated.

Little stands in the way of the universities in the development of effective Environmental Education programmes. "The Criteria" are sufficiently flexible to allow for all eighteen key elements, and there is a will amongst lecturers to develop such programmes. However the study identifies a number of problem areas in Environmental Education, and concludes that none of the universities has Environmental Literacy as a basic aim of its B. Prim. Ed. programmes.

The study concludes with recommendations to the universities on possible improvements to their B. Prim. Ed. programmes.

PREFACE

In 1979-80 the writer completed research into the contributions made by the high school subjects Geography and Biology to Environmental Education, as part of a Master of Education degree. This research, together with work done by others in this field suggests that a major problem in creating environmental awareness lies with teachers. In the first place it appears that many teachers are not well informed about environmental concerns, and in the second place many lack the experience or didactic knowledge to teach Environmental Education effectively.

Ten years experience in both primary and secondary teacher-training, (at pre-service as well as in-service levels) has led the writer to the conclusion that Environmental Education in the primary school demands the greatest attention. In the primary school there is no subject specialisation and there is ample scope for an holistic approach to effective Environmental Education. In addition most children (of all races) attend primary school, while a relatively small proportion of children attend high school.

In 1981 the writer spent 6 weeks in the United States of America and in Canada interviewing people connected with Environmental Education programmes, from the local level (e.g. local schools and/or universities), right through to government level (e.g. the office for Environemntal Education of the Federal Government of the U.S.A). During discussions particular emphasis was placed on Environmental Education in teacher-training. Information gathered during this period has been extensively used throughout this study.

This study is an attempt to identify trends in Environmental Education, worldwide, and in the light of these trends to suggest ways of improving the training of primary school teachers in Environmental Education. The thesis develops a model for the training of primary school teachers and this is used as a yardstick, firstly to evaluate the programmes at four Transvaal universities, and secondly to suggest improvements to these programmes.

The masculine gender is used as a matter of convenience throughout this study.

Kohler Brothers (Pty) Ltd, The Metal Box Company (Pty) Ltd, Nampak (Pty) Ltd, and The Shell Oil Company of South Africa have all made financial contributions towards this study and their assistance is gratefully acknowledged. Grateful acknowledgement is also made of a bursary from The Human Sciences Research Council.

The writer gratefully acknowledges the suggestions and critical appraisal of Prof. R.M. Yule who supervised this study, and the assistance of Prof. K. Paine of the Pretoria Teachers' College who made many valuable comments and suggestions. In addition, numerous lecturers at the four Transvaal teachers' colleges provided information and made helpful comments and suggestions. I must also express my gratitude to the staff of the UNISA library, for their valuable assistance with regard to reference materials.

I am grateful to Mrs. D. Hurry and Mrs. C. Wood who edited the final draft and to Mrs. J. Gettliffe who did the typing.

Finally I wish to record my gratitude to my wife Derryn, and to my children Nicola and Simon, without whose support this study would not have been possible.

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CHAPTER ONE

INTRODUCTION

> "Educators have many options which must be exercised now to stimulate the development of a generation of concerned citizens whose vision and actions will re-establish a quality of life for all."
>
> Centre for In-service Training
> Oak Ridge, Tennessee. 1979.

CHAPTER ONE

INTRODUCTION

1.1 THE BASIC PROBLEMS

Environmentalists in different parts of the world are of the opinion that the attitudes and behaviour of many people of today do not reflect a concern for the health of the environment in which they live. On the one hand they seem ill-informed about issues that might affect the quality of their environment, and on the other they seem ill-equipped to deal with environmental problems.

In countries where formal education plays an important role in the development of the individual, a certain amount of the blame for this situation is laid at the door of the various educational systems. (E.g. Tinley, 1974:4; Hopkins, 1976:6; Stapp, 1978(a):5).

1.1.1 Problems in Environmental Education in South Africa

In 1978 the Wildlife Society of South Africa initiated a general survey of all education departments in South Africa on Environmental Education. (Hurry, 1978.) Although the study was superficial it did indicate that there was cause for concern with regard to Environmental Education in South African schools. The report highlighted three main areas of concern:

* Schools appeared to lack adequate facilities for conducting outdoor education programmes.

- * There appeared to be a general lack of suitable resource materials for both teacher and pupil.
- * Teacher-training programmes did not equip teachers for Environmental Education.

A recent study by Irwin in Natal seems to agree with certain aspects of the Wildlife Society Report. Working with White adolescents in senior secondary schools, Irwin found little evidence of conscious propogation of environmental awareness in White schools, either at primary or secondary level. According to Irwin, some of the blame for this can be laid at the door of the teachers (Irwin, 1982:271). Irwin maintains that those teachers who are efficient environmental educators are invariably "self-taught" and that their training programmes had little or nothing to do with that efficiency. (op. cit.:271).

1.1.2 Problems in Environmental Education in the Transvaal

In the Transvaal a study by Hurry (1980) seems to confirm the findings of the Wildlife Society, and to agree with the opinions of Irwin, as far as the Transvaal Education Department is concerned. Hurry found that, although the efforts of the Transvaal Education Department in Environmental Education are to be commended, there is, however, still cause for criticism, both with regard to educational programmes and the ability of teachers to teach them. He identifies six areas of concern:

- * Environmental Education is not an integral part of the aims and objectives of school syllabuses.
- * There is a lack of holistic teaching in Transvaal schools[+]. This has an adverse effect on the ability of the pupils to have insights into the total human environment.
- * There is little if any co-ordination or co-operation between the syllabus committee of the various high school subjects. This does not lend itself to a co-ordinated Environmental Educational programme in schools.
- * There is a serious shortage of in-service training facilities for teachers.
- * There is a lack of resource materials suitable for Environmental Education.
- * Teacher-Training Institutions
  - do not train teachers to think and teach holistically
  - do not generally give adequate training in the management of fieldwork activities.

1.1.3 An additional problem - that of terminology

A number of writers have pointed out that there are many different interpretations of the term "Environmental Education", especially amongst members of the different education departments. (E.g. Nightingale, 1977:5; Hurry, 1978:55; Clayton, 1979:118.) As decisions on the general purpose, aims and objectives of "Environmental Education" depend on its definition, the lack of one acceptable interpretation has hampered clear assessment of the function of education departments in this field.

An important aim of this study is to establish a clearly stated definition of Environmental Education.

[+] The concept of holistic teaching is discussed in Section 2.4.6

1.2 THE OBJECTIVES OF THE STUDY

1.2.1 The primary aims

There are two primary aims for this study:

a. to examine Environmental Education in a world context.

b. to determine the extent to which the Bachelor of Primary Education programmes at four Transvaal training institutions equip teachers to be effective in Environmental Education.

1.2.2 The secondary objectives

There are two secondary objectives:

a. to establish a clear definition of Environmental Education, as a frame of reference for this study;

b. to make recommendations on possible improvements to the training programmes of primary school teachers with regard to Environmental Education.

1.3 THE APPROACH

In order to achieve these objectives the following approach will be used:

1.3.1 All terms used in this thesis are defined and discussed

Particular attention is paid to:

- Environment
- Education
- Environmental Education

- Environmental Literacy

This discussion is based on a thorough search of the literature, on interviews and correspondence with educationists in the United States of America and Canada and interviews and correspondence with educationists at four teacher-training colleges in the Transvaal.

1.3.2 The aims and objectives of Environmental Education are discussed in detail.

1.3.3 Teacher-training is discussed at two levels.

On the one hand teachers need to be made environmentally aware, and on the other they need to be trained to teach Environmental Education effectively.

Two models are developed, one for each level. These are based on the opinions of educationists both at home and abroad. Information in this regard was obtained by a search through the literature and through personal communications.

1.3.4 Key elements in the teacher-training models are identified as being critical to Environmental Education

These key elements are identified in terms of the aims and objectives of Environmental Education.

1.3.5 The "Criteria for the Evaluation of South African Qualifications for Employment in Education" compiled by the Committee of Educational Heads forms the basis of White teacher-training.

The potential of these criteria for Environmental Education is assessed in terms of the key elements from the teacher-training models.

1.3.6 The Bachelor of Primary Education programmes at four Transvaal colleges are discussed with reference to Environmental Education. Their potential for developing Environmental Literacy in student teachers is assessed in terms of the key elements identified in the teacher-training models.

Information on the Bachelor of Primary Education programmes was obtained through questionnaires and personal communications. All four colleges were visited at least twice, and communication was maintained by correspondence or by telephone.

1.3.7 Suggestions are made on improvements to the Bachelor of Primary Education programmes

1.4 SOURCES OF INFORMATION

1.4.1 Publications

Authorities in the United Kingdom and the United States of America have led the world for a number of years in Environmental Education. Thus an abundant supply of literature on all aspects of Environmental Education, from basic philosophy to practical activities is available from these two countries.

In addition to complete works there are a number of American periodicals which are either specifically orientated towards Environmental Education or contain articles relating to it. These include The Journal of Environmental Education, The Annals of the Association of American Geographers, Science and Children, The Journal of Biological Education, Science Education and The Journal of Teacher Education.

As a result of their involvement in Environmental Education in their own country, the Americans have been drawn into most international programmes and projects. Much of the literature emanating from the United States contains useful information about other countries.

In Britian a number of journals which deal with different aspects of Environmental Education are produced. These include the Review of Environmental Education Developments, the Bulletin of Environmental Education, the Bulletin of the Council for the Protection of Rural England, Bays News and The Classroom Geographer.

Other countries which have produced worthwhile literature on Environmental Education include Australia and Zimbabwe. The Gould League in Australia has produced a number of good occasional publications, while the Ministry of Education in Zimbabwe has set an excellent example with its publications on different aspects of Environmental Education.

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) is most active in the field of Environmental Education. The organisation has a separate wing based in Paris - the United Nations Environmental Programme (UNEP) which concentrates much of its attention on Environmental Education. UNEP publishes a newsletter "Connect" which contains useful information about its activities.

1.4.2 Personal communications

In 1974-75 the writer spent a year in the United Kingdom researching for a Master of Science degree in ecology.

Many of the people he worked with are involved in Environmental Education and correspondence with them was entered into for purposes of this research.

During March-April 1981 the writer spent six weeks in the United States of America and Canada interviewing environmental educationists in schools, universities, state departments and in the Federal Government itself. The interviewees were chosen after a search through the current literature and after consulting with other researchers in the field of Environmental Education in Southern Africa. Most appointments were made well in advance of leaving South Africa. (A full list of all overseas interviewees is to be found in Appendix A.)

All four rectors of the selected Transvaal teacher-training colleges were interviewed at least once, while members of their staff were interviewed, telephoned and corresponded with. (All the South African respondents who were personally interviewed or telephoned, or with whom correspondence was entered into, are listed in Appendix B.)

A draft research questionnaire was compiled using suggestions from Kahn and Cannell,(1967), Stewart and Cash,(1974), Richetto and Zima, (1976) and others. This questionnaire was first tested with a number of educationists, including the rectors of three teacher training colleges, before it was finalised.

(A copy of the research questionnaire is in Appendix C.)

CHAPTER TWO

THE CONCEPTUAL FRAMEWORK

> "If present trends continue, the world in 2 000 AD will be more crowded, more polluted, less stable ecologically, and more vunerable to disruption than the world we live in now. Serious stresses involving population, resources, and environment are clearly visible ahead. Despite greater material output, the world's people will be poorer in many ways than they are today."
>
> The Global Report to the President of U.S.A, 1980

CHAPTER TWO

THE CONCEPTUAL FRAMEWORK

2.1 INTRODUCTION

In this chapter the following terms are defined and discussed:

- Environment
- Education
- Environmental Education
- Holistic Environmental Education

2.2 ENVIRONMENT

In this study a distinction is drawn between man's "bio-physical" environment and the "total" environment in which he lives.

The total human environment consists of a number of inter-linked sets of interactions. In addition to the bio-physical sets, there are sets such as the cultural set, the social set and the psychological set. For the purpose of this study all non bio-physical elements are grouped under the general heading of "cultural" elements.

The bio-physical environment may itself be divided into three sets of elements. Each represents an environment of its own. These are the biological, the physical and the built environments. The biological and physical environments are discussed in terms of basic ecological principles, while the built environment is discussed as part of the cultural environment.

2.2.1 The bio-physical environment - The basic ecological principles.

In a previous study Hurry (1980) discussed the characteristics of ecosystems. This discussion is summarised in this section.

Figure 1 shows the ecosystem (the bio-physical environment.

2.2.1.1 Basic elements of the ecosystem.

- The sun is the prime source of energy for Earth.
- Elements in the ecosystem may be divided into two basic groups, namely biotic (living) elements and abiotic (non-living) elements.
- Elements within the ecosystem are constantly interacting with one another. The interactions are as much characteristic of the ecosystem as the elements themselves.
- The elements in an ecosystem may be described as structures, and the interactions between them as processes.
- Processes in the ecosystem tend to maintain it in a state of homeostatic equilibrium.

2.2.1.2 Trophic levels

- Green plants use solar energy to produce food. Plants are known as producers.
- Animals obtain their energy by feeding on plants or on other animals. They are known as consumers.

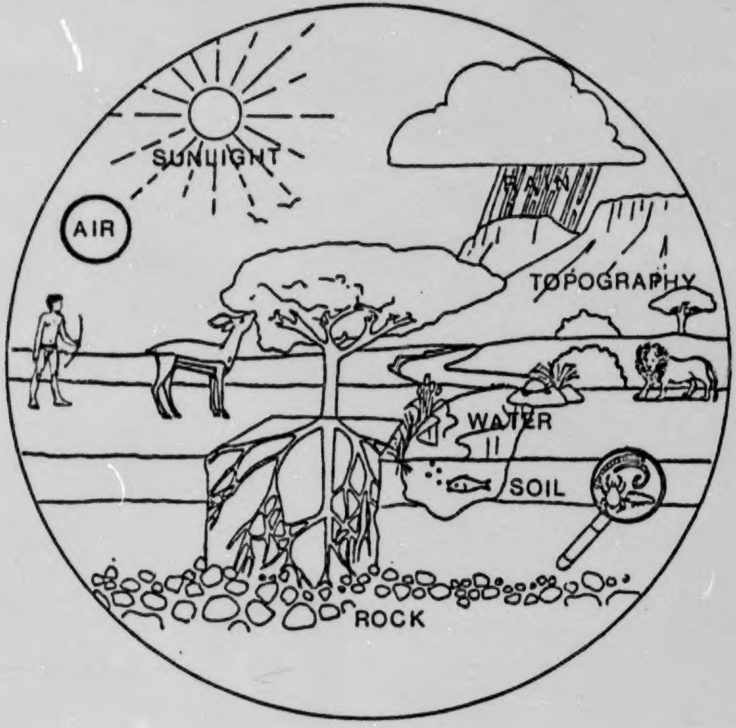


FIGURE 1 : THE ECOSYSTEM (THE BIO-PHYSICAL ENVIRONMENT)
(Hurry, 1980:13)

- Certain animals (herbivores) feed on green plants.
- Certain animals (carnivores) eat other animals.
- A number of animals (omnivores) eat both plant material and other animals. In the biological sense of the word man is an omnivorous animal.
- Each level of food consumption is known as a trophic level. (For example green plants are at the first trophic level, herbivores are at the second trophic level, and carnivores are at the third trophic level. Omnivores can be either at level two or at level three.)
- At each trophic level energy is lost (as heat) during metabolic processes. This means that the amount of available energy decreases through trophic levels. This in turn results in lower numbers of animals at the higher trophic levels.

  A corollary to this is that if animal numbers increase at a certain rate, food will have to be available at a proportionally higher rate to satisfy their energy requirements.

2.2.1.3 Cycles in the ecosystem

A number of key elements are recycled in the ecosystem. These include water, carbon, nitrogen, and sulphur.

These cycles are continually affected by man's activities. For example deforestation causes a decrease in transpiration, and a decrease in absorbtion of carbon dioxide, while the burning of fossil fuels causes an increase in the levels of sulphor dioxide in the atmosphere.

2.2.1.4 "Take-outs" and "in-puts"

(a) Organisms live off their environment. They take from the environment what they require for nutrition and respiration. The environment provides them with a habitat in which they can live safely and reproduce. These may be referred to as "take-outs".

(b) Organisms also put things into the environment. On the one hand they put in waste products of respiration and nutrition, while on the other they may alter the environment through their activities (e.g. nest building). These may be referred to as "in-puts".

(c) "Take-outs" and "in-puts" affect the nature of the ecosystems.

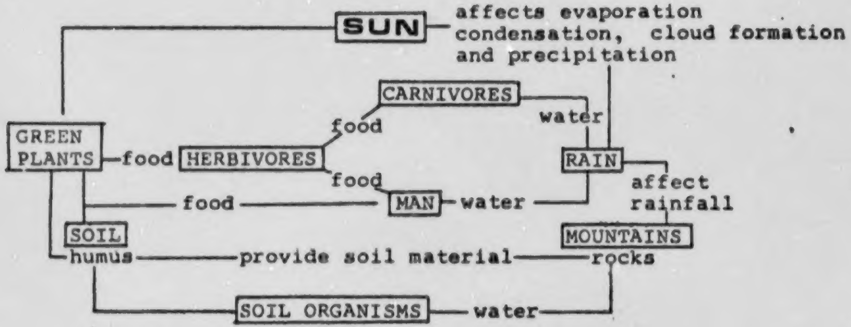


FIGURE 2

SELECTED PROCESSES (INTERACTIONS) IN THE ECOSYSTEM

2.2.1.5 The concept of habitats

Habitats are basic living units within the ecosystem. They provide the organism with all its physiological requirements and a place where it can live and reproduce in relative safety.

The safety of any organism and its long term survival is inextricably tied up with it's habitat. Conservors of wildlife have realised this and are focussing attention more and more on the conservation of the habitats of endangered species, rather than on the species themselves.

Man's activities have affected the quality of habitats. Many have changed in character and are now unable to support the plants and animals that they were once capable of supporting.

2.2.1.6 Homeostatistic equilibrium - the "balance of nature"

On a human time scale ecosystems that are not affected by man seem to be unchanging in character. In point of fact all natural systems are changing constantly, some more rapidly than others. The changes take place in response to biological and physical changes within the system.

The physical environment is constantly changing through geological time. The climate in different parts of the world changes slowly (over thousands of years) and internal and external forces are constantly changing the nature of the earth's crust. Ecologists recognise that natural systems respond to physical changes through a process known as succession. With this process plant and animal communities evolve to suit the changed set of environmental conditions. The first stage of succession is known as the pioneer stage, while the last stage is known as the climax stage. The pioneer stage is characterised by low species diversity (plants and animals) while the climax stage has high species diversity.

During succession species replacement from one stage to the next occurs because populations tend to modify the physical environment (soil, micro-climate, etc.), making conditions favourable for other (different) populations. The extent to which new populations develop depends upon symbiotic relationships between others, and these in turn depend upon physical factors such as climate and soil. There is thus a state of equilibrium between biotic and abiotic elements. Any changes in the abiotic nature of the system will be met by the changes in the biotic elements. This constant state of balance between the elements may be called "homeostatic equilibrium". In layman's terms this is known as "the balance of nature".

It is to be noted that the term "the balance of nature" does not infer that nature is unchanging. It infers rather that:

- given time an ecosystem will adjust itself to changes from within.
- the tendency in ecosystem is to maximise production within the constraints imposed by physical conditions.

Succession in an ecosystem is a slow process by human standards, taking as it does many thousands of years from pioneer to climax stage. If human activities interfere

with, or reverse natural processes in ecosystems, the recovery of those ecosystems, in terms of succession could be very slow. In the case of those ecosystems of more direct significance to man (such as the Amazon forests- of major importance with regard to world climate), interruption of natural stages of succession (upsetting the balance of nature) could have severely adverse consequences for man.

2.2.1.7 The interconnectedness of systems

All natural systems are interconnected, although the connection may be more direct in some cases than in others. For example the river systems of South Africa are directly linked to the ocean systems into which they flow, while a forest system in Natal is indirectly linked to the Indian Ocean via the rivers that flow out of that system and the air that moves over it.

Because of the interconnectedness of systems any changes to one system will affect other systems to a greater or lesser extent. For example, both air pollution originating from Durban, and water pollution from the Tugela River will have an effect on marine life along the Natal coast, although the latter will have a far greater effect on the marine life than the former.

2.2.1.8 Man in the ecosystem

In the biological sense of the word, man is an animal within the ecosystem, since he is dependent on the environment for his physical needs. However, man is also dependent on the bio-physical environment for other needs such as those of recreation and spiritual renewal.

Broadly speaking cultural man can be divided into two groups, namely those who have developed technologies to help them satisfy their needs, and those who have not. In some parts of the world where man has developed technologically, he has a measure of independence from the bio-physical world. In other parts of the world where technology has not developed, he is, if anything, more dependent on the bio-physical environment.

Man's activities have a direct impact on the bio-physical environment. On the one hand his constructions add to or alter the landscape he occupies, while on the other his activities affect natural processes within the environment.

The impacts which man has on his bio-physical environment may be discussed in terms of "take-outs" and "inputs" (See section 2.2.1.4.) These may have a positive or a negative effect on the quality of the environment. The measure of this is the way in which they affect the environment, and therefore the quality of life of the people who occupy it. (The quality of life concerns both man's physical needs as well as his emotional and spiritual needs.)

Positive "inputs" include afforestation projects, organic farming, and soil and habitat conservation schemes. Negative "inputs" include roads, railways, buildings and other constructions which could threaten the mental or physical well being of people. They also include all forms of air, water and land pollution.

In the case of "take-outs" man has a marked "robber" philosophy. The exploitation of minerals, natural forests

and wild animals are the best known examples. However reductions in potable water supplies, clean air, and fertile soil are also clear indicators of man's negative "take-outs".

Man's numbers are increasing rapidly. (The present doubling rate is 40 years). As numbers increase, so the detrimental effects on the bio-physical environment (man's habitat) become more noticeable. For example:

- More air pollution, leading to greater risk to health;
- More soil erosion, leading to a decrease in food production;
- Greater overcrowding, leading to an increase in social disorders.

Since cultural processes in an environment ultimately affect its quality, it is important to consider them as part of the total human environment.

2.2.2 The cultural environment

We have seen that the bio-physical environment in which man lives consists of a complex set of structures and processes. We have seen also that man, in the biological sense of the word, is an organism within that system and totally dependent on it. At the same time man affects his life support system either positively or negatively through his "take-outs" from it and his "in-puts" into it.

In addition to his biological characteristics man also has a spirit and an intellect. Through intelligent actions and activities he has created an extra dimension to his environment.

This dimension is the cultural dimension .

Winick, (1956 : 144), describes culture as "all that is non-biological and socially transmitted in a society, including artistic, social, ideological and religious patterns of behaviour." He goes on to say that cultures produce "artifacts and products", ranging from simple tools to complicated machinery, from mud huts to sky scrapers. (The variety and/or complexity of "artifacts and products" is directly related to the complexity of the culture.)

Buildings, roads, bridges, towers, pylons and other constructions are a physical expression of cultural processes. This so-called "built environment" may be seen as part of both the bio-physical environment (in that the constructions become part of it) and the cultural environment (for the reasons given above.)

Culture thus has two basic components. The first is the pattern of behaviour involving individuals and groups within the culture, and the second consists of the artifacts and products of that culture.

2.2.3 The total human (cultro-bio-physical) environment

The artifacts and products of a culture impinge directly on the bio-physical environment. (They are, in fact some of the "in-puts" into the ecosystem that were discussed in section 2.2.1.4.) Taken together with the bio-physical environment they form the total human environment. For the purpose of this study this total environment is referred to as the cultro-bio-physical environment

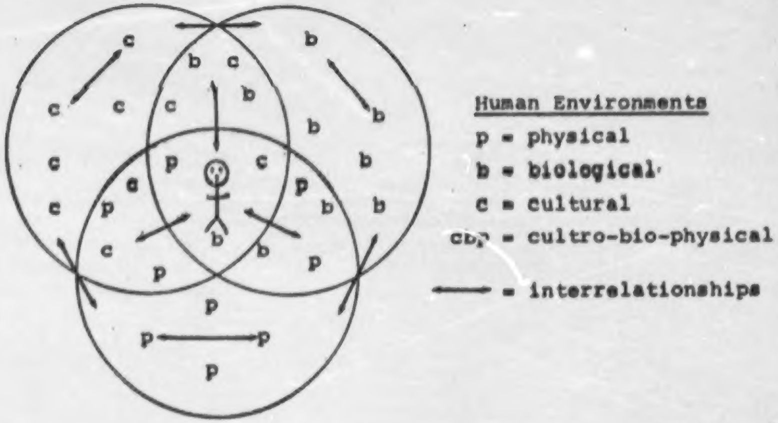


FIGURE 3 : THE CULTRO-BIO-PHYSICAL ENVIRONMENT

A number of social scientists would agree with this view of the "total" nature of the human environment.

Social anthropologist Davies, (1972:77) describes the human environment as "the surroundings, physical and spiritual, in which the individual grows, and which affects the growth and development of the individual".

Sociologists Theodorson and Theodorson (1967:132) have a similar view of the total human environment. They describe it as, "Everything that stimulates and influences the behaviour of the individual or the group". They describe the elements which make up the environment as being physical, social or cultural (op. cit).

The Dictionary of Psychology (Dushkin Publishing Group, 1973:34) describes the human environment as the "sum total of external conditions, including social and physical factors which have the potential to influence the individual".

The educationist's view is supplied by Farrant, (1964:266) who says that the human environment is "everything in the child's immediate vicinity which can influence its development".

2.2.4 Interactions within the total human environment.

A point which requires emphasis relates to interactions (processes) in the total human environment. (See Figure 3). Many of these interactions do not involve man at all (e.g. biological or physical processes); some involve man to a greater or lesser extent (e.g. impacts that man may have on the bio-physical world); while others involve mainly man (e.g. cultural interactions).

The fact that the interdctions are as much part of the total human environment as the elements they involve is of great significance when the nature of Environmental Education is considered.

2.2.5 The educational significance of the concept of totality

All references to the human environment refer to the totality of that environment. There is no limit to the catalogue of elements, either cultural or bio-physical, which may be identified in the environment of a single human being. The "growth and development" of the individual is in response to the total environment in which he lives.

A number of educationists have stressed this point of view. Viljoen and Pienaar, (1971:188) describe the world of the child as a "totality of situations, events and cultural values ..... in which his behaviour, thoughts and feelings are involved .... ". Good, (1973:204) describes the environment of the child as "all the objects, forces and conditions that affect the individual through such stimuli as he is able to receive." He makes the important point that the child may respond "consciously or unconsciously" to these stimuli (op. cit.).

From what has been said it is clear that any educational programme which calls itself "environmental" must be concerned with the total human environment. This is a fundamentally important point, and one which will be developed later in this study.

2.2.6 The "Spaceship Earth" metaphor

A number of writers (e.g. Combes, 1977:22; Brown, 1977:40; Rentsch, 1973:3) have compared the earth to a spaceship and its inhabitants to its crew.

The spaceship metaphor is highly significant for two reasons:

- The earth, like a spaceship, has a limited life-support capability, with limited supplies of air, water, living space and other life-sustaining elements.
- The mental and physical health of the crew depends upon the condition of the spaceship, and conversely the condition of the spaceship depends upon the crew.

The knowledge, attitudes, values and behaviour of the "crew" of "Spaceship Earth" are the main concerns of Environmental Education, and the spaceship metaphor is developed further in the introductory section to the discussion on it.

2.2.7 Summing up the discussion on the total human environment

(a) The environment of an organism, whether human or non-human, consists of all those factors that affect its growth and development.

(b) The total human environment has three basic components. The three, which are inextricably interrelated are the biological, the physical and the cultural.

(c) Organisms have an impact on their environment. In the case of man this impact may be considerable.

(d) Man is totally dependent upon the bio-physical environment for all his physiological, and many of his psychological needs.

(e) The metaphor of "Spaceship Earth" is appropriate since the Earth's capabilities to maintain an acceptable quality of life for the majority of its inhabitants is limited, and because the co-operation of the crew is needed in order to maintain these capabilities.

2.3 EDUCATION

At the outset it should be stated that all references to education in this section, unless specifically stated, are to school education, i.e. from Grade 1 to Standard 10.

2.3.1 The broad principles

Having discussed the term "environment" what of "education"?

In a previous study Hurry, (1980:31) discussed in detail the views of a number of educationists. This discussion can be summarised as follows:

* Education involves a number of complex on-going processes. (E.g. Good, 1973:202; Gutek, 1974:4).
* Educational processes are not random processes. They have been carefully and purposefully developed. (E.g. Oberholzer, 1968:49; van Rensburg, et al 1979:251).
* Education relates to the conservation, transmission and renewal of culture. (E.g Gutek, 1974:4; Yule, 1979:8).
* Education leads to behaviour which is acceptable within a particular culture. (E.g. Hubermann, 1970:8; Good, 1973:202)

2.3.2 Education and culture

It has been established already that culture is part and parcel of the total human environment. Education is a process within a particular culture. Educational theories and practices will succeed only if they are compatible with the culture of the people.

Good, (1973:202) defines education as the "aggregate of all processes by means of which a person develops abilities, attitudes, and other forms of behaviour and positive value in the society in which he lives".

Hubermann, (1970:8) says "the main purpose of education is not to produce good students, but rather versatile and well trained participants in society".

It has been discussed previously that interactions within the human environment may be two-way processes. In terms of this statement, what role has education to play with regard to cultural change?

Kneller, (1978:114) discusses education with regard to cultural change. He agrees that the first task of education is "to perpetuate the achievements of culture",but also maintains that education should "pave the way for cultural change". He poses the question : "Can it (education) train the coming generation not merely to adapt to, but also to initiate specific changes in the culture?".

Weinberg, (1971:77) has also written on the reciprocal relationships between education and culture. He sees education as a functional part of a total society, and that "reciprocal change relationships will always exist between the several parts".

Coombs, (1968:109) states that "the new stress (on education) must not be so much on producing an educated person, as on producing an educable person who can learn and adapt himself efficiently all through his life to an environment that is constantly changing."

Kazamias, (1971:636) has touched on reciprocity between education and political systems. He quotes the example of Tanzania where radical changes were introduced by the central government in response to a "call from the people" for educational goals in accordance with the "new national identity and aspirations".

The National Education Commission of the Rebublic of Bophuthatswana would appear to agree with both Weinberg and Kazamias. In the foreward to its report, (1978:VIII) it mentions in a number of places the constant interaction between the educational process and the people it serves. For the Commission education should be "..relevant.. to the people of Bophuthatswana.. not only in their existential circumstances, but also in the world of tomorrow..". The Commission goes on to stress that the educational system should be dynamic; that "into the fabric of both its theory and practice there should be built components of an evolving, on-going nature which will continually analyse existing conditions in education, identify appropriate new trends, modify present provisions in the light of new needs ...." (op. cit.)

Kneller, (1978:80) discusses the broader issues of cultural change. Culture may change in three ways:

- Through origination, i.e. the development of new ideas, concepts, inventions.
- Through diffusion, i.e. the acceptance of ideas from other cultures.
- Through re-interpretation, i.e. the modification of an existing element (e.g. education) to meet fresh circumstances.

Kneller (op. cit.) also mentions the problem of cultural lag with regard to cultural change. This signifies the tendency of certain elements of the culture (e.g. education), to change more slowly in response to environmental changes.

Education, culture and the reciprocal processes between them are highly significant when Environmental Education is considered. To what extent do the theories and practices of education relate to the total human environment? To what extent do changes in this environment (in either the cultural milieu or the bio-physical milieu) affect changes in education? These and other questions will be discussed in Section 2.4.

2.3.3 Education and the "whole" child.

A number of writers have discussed the didactic principle of totality. (E.g. Yule, 1979:24-25; Duminy and Söhnge, 1980:22-23.) This principle emphasises the fact that the educand is a total human being with many different facets to be developed. In addition to the more frequently considered facets of intellectual and physical development, there are other aspects to consider such as emotional and spiritual development.

In the didactic situation, although intellectual development may recieve most emphasis, the educator must be aware constantly of the educand's other development needs.

The educational process is, in the main, a process of acculturation in the broadest sense of the word. Nevertheless, in order to be fully developed within a culture, the individual needs to be fully developed as a person. It is this personal development which provides the key to successful education. This is a consideration which is of great importance when educational programmes (e.g. Environmental Education) are being developed.

2.3.4. Child centred education and school subject objectives-The Example for Geography.

The discussion thus far has highlighted two important points. The first is that education is a form of acculturation (and hence takes place within a particular cultural context), and the second is that education is child centred.

Hurry, (1980:80-81) has shown that the Transvaal Education Department states its general aim for education in broad terms. He quotes the Transvaal Education Department as follows:

> Die algemene doelstellings vir die onderwys in sy geheel is die bemeestering van inhoude met die oog op die verwerwing van volwassenheid soos in die RSA geinterpreteer. Die besondere doelstellings (gedifferensiëerde doelstellings) sal dui op doelstellings ten opsigte van, onder ander, verskillende vakke, en sal 'n verdere vertolking van die algemene doelstellings wees..
>
> (T.E.D., March: 1973)

Each and every school subject has its own syllabus. Contained in each syllabus are the aims and objectives of the subject. Since the overall goal of education relates to the total effect of all school subjects these aims and objectives are of fundamental importance in the educational programme of the child.

Marsden, (1976:29-35) discusses the value of subject orientated objectives which cater not only for the subject concerned, but also for the intellectual development of the child.

He bases his objectives on the work done by Bloom and his associates in the field of educational objectives. (Bloom, 1956:201-207; Kratwohl et al, 1964:176-185)

Marsden takes two domains of objectives, namely the cognitive and the affective domains, and applies the subcategories of each to the teaching of school Geography. In doing so he creates an incisive picture of what good subject teaching should be, taking both the requirements of the subject and the needs of the individual into account.

The following is a summary of Marsden's discussion on these objectives:

(a) The cognitive domain

- Knowledge

  Knowledge refers largely to the recall of information or the recognition of information on maps, diagrams or photographs. Knowledge refers to both basic facts and to concepts.

- Comprehension

  Comprehension involves the ability to translate one form of information to another form. Comprehension also involves the interpretation of facts and the ability to elucidate relationships that exist between phenomena.

  Comprehension also involves the ability to extrapolate.

- Application

  This implies the ability to use abstractions in particular and concrete situations.

- Analysis

  This is the ability to break down a set of information into its constituent elements, and in so doing to recognise its key elements.

- Synthesis

  Synthesis involves the ability to put together elements gained through research or study to form a global picture.

- Evaluation

  This involves the ability to make judgements about the value of something in qualitative or quantitative terms.

(b) The affective domain

Marsden goes on to discuss the affective domain of educational objectives. He sees the importance of stating educational objectives in affective terms, despite the fact that values, attitudes and beliefs are difficult to decide on in the first place, and difficult to measure in the second.

- **Receiving**

  Receiving involves the awareness of Geography as a discipline. It involves a willingness to accept Geography as a subject of importance, and it involves a sensitivity towards geographical information.

- **Responding**

  In responding, the student is willing to read assigned literature on Geography. He voluntarily acquaints himself with current Geographical literature. The student also enjoys a discussion or argument on current issues in Geography.

- **Valuing**

  Valuing involves an identification on the part of the learner with Geography as a science. The student assumes an active role in the subject.

- **Organisation**

  Through conceptualisation the student develops a rationale about the role of Geography in the world at large. The student forms judgements which reflect the belief that Geography provides a system of enquiry that helps to understand world problems and to contribute to their solutions.

- **Characterisation by a value or a value complex.**

  The student learns to view problems from a Geographical point of view.

  Characterisation also involves the adoption of a philosophy of life which is consistent with Geographic thought or practice.

  Characterisation also involves behaviour which reflects concern for the Geographical environment.

2.3.5 Objectives for all school subjects

The formulation of cognitive and affective objectives for a particular subject (Geography) gives the teacher definite guidelines for the teaching (and learning) of that subject, From the above discussion it is apparent that the objectives are not only concerned with the acquisition of factual knowledge, but are also concerned with the development of insight into the subject. At the same time it is apparent that the objectives are not entirely subject orientated and that there is ample scope for the development of the "whole" child. In particular the intellect and emotional development of the child has been taken into account.

It is reasonable to suppose that if all school syllabuses contained similar aims and objectives, then the total effect of the educational programme would be to benefit both the subjects as disciplines as well as the development of individuals. This supposition is of considerable significance when Environmental Education at school is considered.

2.3.6 Individual development - achieving personal autonomy.

We have said that a prime aim of education is to develop the individual within a certain culture. At the same time the educational process must make allowances for the needs and aspirations of each educand.

We have also seen that stated objectives for particular school subjects may be formulated both from the point of view of the subject itself and from the point of view of the intellectual development of the individual.

Harris, (1972:119-148) suggests one single overarching aim which not only links the needs of the individual with the needs of the culture, but also takes into the account the aims and objectives of individual school subjects. He gives this aim as the development of personal autonomy.

Personal autonomy involves four, overlapping, points:

* Autonomy implies the acquisition of knowledge, where knowledge is far more than just an accumulation of facts. Knowledge implies the acquisition of skills such as those related to research and experimentation, and the ability to apply information to new situations.

Implicit in this is that teachers should avoid too much rote learning. There should be a nice balance between the acquisition of factual knowledge and its application to new or different situations.

* Autonomy implies that an individual is in a position to pursue individual interests or valued activities without hindrance.

Implicit in this is that either the school or the community should provide the opportunities or the amenities for the pursuit of this interest.

* Autonomy is derived from satisfaction of needs. In addition to the basic physiological needs, there is the need to have interests, the need to affiliate with a peer group and the need to achieve.

Implicit in this is that either the community or the school should provide the facilities to meet these needs.

* The development of personal autonomy is linked with the development of moral standards. The individual must be able to make moral judgements about events and people.

Implicit in this is that the school should provide the pupils with decision making experiences relating to a wide range of simulated issues.

Harris holds the view that education should cater for the "whole"child in the "whole" environment. In working for the development of personal autonomy in individuals, the educational programme is trying to achieve the best working relationship between each individual and his total environment.

Since the individual is constantly interacting with his total environment, it must be said that education has a definite role to play in ensuring the best kinds of relationships for the individual as well as his environment.

(It is of interest to note that in the case of teacher education at least one college of education, the Johannesburg College of Education, has the development of personal autonomy as one of its prime objectives for its students. (Johannesburg College of Education, 1978:2) This point will be more fully discussed in Chapter 6.)

2.3.7 Summing up the discussion on education

In summarising the discussion on the nature of education, the following points are made:

- The general aim of education is to lead the child into responsible adulthood within a particular culture.
- Education is a process within a particular culture. It is both a product of that culture and a force for change within it.
- Education is concerned with the development of the "whole" child.
- In South Africa the general and specific aims of education are expressed through the different school subjects. It is important that the aims and objectives of each school subject should reflect a concern for both the subject itself as well as the needs of the individual.
- Education should lead to the development of personal autonomy in the individual. Personal autonomy reflects a state of homeostasis between the individual and the total environment.

2.4 ENVIRONMENTAL EDUCATION

It has been established already that the individual is constantly interacting with his total environment. Since this environment consists of cultural as well as biological and physical elements, it follows that what the child learns at school could have some bearing on, or reference to, some aspects of this environment. In this sense then, all school subjects have the potential to contribute in some way to "Environmental Education". However, in order to focus attention on the training of primary school teachers in the Transvaal it is necessary to consider the nature of Environmental Education more precisely, and for this reason discussion is included here.

2.4.1 What is Environmental Education?

2.4.1.1 The "Spaceship Earth" metaphor

The metaphor of "Spaceship Earth" was discussed in Section 2.2.6. In this section it was pointed out how appropriate this metaphor is. The Earth has a limited capability for an acceptable quality of life for its inhabitants. Moreover this capability is determined by the activities of the "crew".

This metaphor is not only appropriate for discussions on Environmental Education, it is also most convenient. Most people know a little about spaceships, particularly with regard to their limited life-support capabilities, and the use of the metaphor emphasises the true nature of Earth as a life-support system.

2.4.1.2 Maintaining the health of "Spaceship Earth"

The International Union for the Conservation of Nature and Natural Resources (IUCN) is the largest world body of its kind. In 1979 the IUCN, together with the world Wildlife Fund (WWF) and the United Nations Environmental Programme (UNEP) compiled a World Conservation Strategy (WCS), which was launched in 34 countries, including South Africa. (Wildlife Society of Southern Africa, 1979:10-11). The aim of the WCS is to achieve three main objectives of environmental conservation:

1. to maintain essential ecological processes and life-support systems (such as soil regeneration and protection, the recycling of nutrients, and the cleansing of waters), on which human survival and development depend .

2. to preserve genetic diversity (the range of genetic material found in the world's organisms), on which depend the functioning of many of the above processes and life-support systems, the breeding programmes necessary for the protection and improvement of cultivated plants, domesticated animals and micro-organisms, as well as much scientific and medical advance, technical innovation, and the security of the many industries that are using living resources.

3. to ensure the sustainable utilisation of species and ecosystems (notably fish and other wildlife, forests and grazing lands), which support millions of rural communities as well as major industries.

2.4.1.3 The training of the "crew"

The IUCN, UNEP and the WWF acknowledge that without the full support of the people their Conservation Strategy is doomed to failure. They maintain that support at grass-roots level can only be obtained through effective Environmental Education programmes.

2.4.2 Current definitions of Environmental Education

Because of their involvement with global environmental conservation the IUCN has produced a comprehensive definition of Environmental Education. This definition which is widely used, reads as follows (Wildlife Society, 1976:68).

> Environmental Education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture and his bio-physical surroundings. Environmental Education also entails practice in decision making and the self-formulation of a code of behaviour about issues concerning environmental quality.

A second definition which is widely used is that contained in the United States Environmental Education Act of 1977 (Nightingale, 1977:6). This definition reads:

> Environmental Education is an integrated process which deals with man's interrelationship with his natural and man-made surroundings, including the relationship of population growth, pollution, resource allocation and depletion, conservation, technology and urban and rural planning in the total human environment.

> Environmental Education is a study of the factors influencing ecosystems, mental and physical health, living and working conditions, decaying cities, and population pressures. Environmental Education is intended to promote among citizens the awareness and understanding of the environment, our relationship to it and the concern and responsible action necessary to assure our survival and to improve our quality of life.

The definition of Stapp and Cox, (1979:3) is also included here. It is both concise and appropriate:

> Environmental Education is a process aimed at developing a world population that is aware of, and concerned about, the total environment and its associated problems, and which has the knowledge, attitudes, motivations, commitments and skills to work individually and collectively towards solutions of current problems and the prevention of new ones.

There are occasions when it is useful to use a shorter, simpler definition of Environmental Education. The following definition is offered:

Environmental Education is a process leading to the acquisition of environmental knowledge and the development of attitudes, values and patterns of behaviour which reflect a concern for the health of the total environment as well as for the quality of life of all its inhabitants.

2.4.3 The aims and objectives of Environmental Education

2.4.3.1 Long term aims

Some of the aims and objectives for Environmental Education were discussed in the previous section. The Belgrade Charter of 1975 (UNESCO-UNEP, 1976:2) gives the long term goal of Environmental Education

> "to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills,attitudes, motivations and commitment to work individually and collectively towards solutions of current problems and the prevention of new ones."

Smyth, (1977:107) gives a similar goal when he states

> "Environmental Education's goal is to enable people to recognise the factors which determine the nature and quality of their environment so that they may respect and appreciate it to the full, and participate constructively in its management and development."

Hungerford and Peyton, (1980:11) give the major goal of Environmental Education

> "to produce an environmentally literate citizenry that is both competent to take action on critical environmental issues and willing to take that action".

Finally, Harvey, (1977:68)states simply that the long term goal of Environmental Education is perceived to be

> "a homeostatis between quality of life and quality of environment".

2.4.3.2 Objectives

The Belgrade Charter lists six objectives for Environmental Education (UNESCO-UNEP, 1976:2). These are

- Awareness: to help indivduals and social groups acquire an awareness of, and sensitivity to, the total environment and its allied problems.

- Knowledge: to help individuals and social groups acquire basic understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.

- Attitude: to help individuals and social groups acquire social values and strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement.

- Skills: to help individuals and social groups acquire the skills for solving environmental problems.

- Evaluation ability: to help individuals and social groups evaluate environmental measures and education programmes in terms of ecological,political, economic, social aesthetic and educational factors.

- Participation: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems; to ensure appropriate action to solve those problems.

Harvey's long term goal for Environmental Education was mentioned earlier. He also identifies three subordinate goals relating to the main goal. These are (Harvey, 1977:67):

- The development of environmental literacy where this means possessing of basic skills, understanding and feelings for the human environment. Here the emphasis is on knowledge.

- The development of environmental competency where this means the ability to use literacy to apply, analyse, synthesise and evaluate knowledge. Environmental competency also implies values consistent with the first subordinate goal. Here the emphasis is on attitudes.

- The development of environmental dedication whereby a person who has both environmental literacy and competency acts consistantly in a manner compatible with homeostasis between quality of life and quality of environment. Here the emphasis is on behaviour.

Both sets of objectives may be related to the educational objectives suggested by Bloom and his associates which were discussed in Section 2.3.4. It is of interest to note that the objectives listed above fall mainly into the affective domain although there are some which fall into the cognitive and/or psychomotor domains.

Of the six objectives listed at Belgrade one may be classified as cognitive (the second), four as affective (the first, third, fifth and sixth)and one as falling into all three (the fourth).

Harvey's objectives fall mainly into the affective domain. Only the first of the list may be said to have a cognitive component.

From this it is clear that good objectives for Environmental Education must take into account the informational and training aspects of the process as well as the development of sound attitudes and positive behaviour resulting from these.

2.4.4 Environmental Literacy

In this study emphasis is laid on desirable environmental attitudes which lead to positive environmental behaviour. For the purposes of this study positive environmental behaviour is described as Environmental Literacy (with capitals). This terms has been used by a number of writers in this connection. (E.g. Rentsch,(1973:5) Hungerford and Peyton, (1977:74); Stapp and Cox (1979:24).

In 1979 President Nixon used the term "environmental literacy" on the occasion of the "First Annual Report of the Council on Environmental Quality", (1979:VII) when he said:

> We must seek nothing less than basic reform in the way our society looks at problems and makes decisions. Our educational system has a key role in bringing about this reform...... It is also vital that our entire society develop a new awareness of man's relation to his environment that might be called "environmental literacy". This will require development and teaching at every point in the educational process.

The term "Environmental Literacy" (with capitals) is used throughout this study. It has a specific meaning. A person who is Environmentally Literate:

* is aware of the natural and man-made environment of which he is part, and that he sees his places of work, residence and recreation as part of the fabric of his own ecosystem. He sees himself as a living part of, and interacting with, his ecosystem.

* is aware of the natural resources upon which he is directly or indirectly dependent, and that he has some understanding of finite and renewable resources.

* has a conviction of his individual responsibility for the health of the land, where health is the capacity of the land for self-renewal. (This point of view was first expressed by Aldo Leopold, (1949) in his book "Sand County Almanac", (Leopold, 1970:237-264).

* has been stimulated into positive environmental action in his daily life. He is committed to caring for his environment and its resources, in no matter how small a manner.

* is concerned with developing or maintaining a quality of life which is not only acceptable to the majority, but which is also in harmony with the capabilities of the environment.

2.4.5. Guiding principles for effective Environmental Education

Having discussed the aims and objectives of Environmental Education, what guiding principles should be applied in order to achieve them?

At the World Inter-governmental Conference on Environmental Education at Tbilisi, USSR in October, 1977, eleven guiding principles for effective Environmental Education were adopted (Stapp and Cox, 1979:13-14). These principles were suggested as guidelines for the development of all Environmental Education programmes.

Environmental Education should:

* consider the environment in its totality - natural and built, technological and social, economic, political, moral, cultural and historical, and aesthetic aspects.

* be a continuous life-long process; it should begin at the pre-school level and continue through all formal and non-formal stages.

* be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;

- emphasise active participation in preventing environmental problems and working towards their solution;
- examine major environmental issues from local, national, regional, and international points of view, so that learners receive insights into environmental conditions in other geographical areas;
- focus on current environmental situations;
- emphasise the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;
- utilise diverse learning environments and a broad array of educational approaches;
- focus on the learner's own community and relate topics being discussed to state, regional, national and international issues and perspectives;
- relate environmental sensitivity, knowledge, problem-solving and values clarification at every school level;
- enable learners to play a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences.

It is suggested that the guiding principles should be reduced in number, in order to make the task of educators easier. The following SIX are suggested. They are stated in broader terms than those given above, yet they provide the teacher with explicit guidelines for effective environmental teaching.

- Environmental Education programmes must be taught holistically
- Learning experiences must be based on knowledge of the local environment

- Learners must be practically involved in local environmental studies (i.e. fieldwork and/or practical work is essential)
- There should be active participation in preventing or solving environmental problems, particularly at the local level
- There must be an internal locus of control with regard to environmental problems studied.
- Values clarification must be part of the educational process.

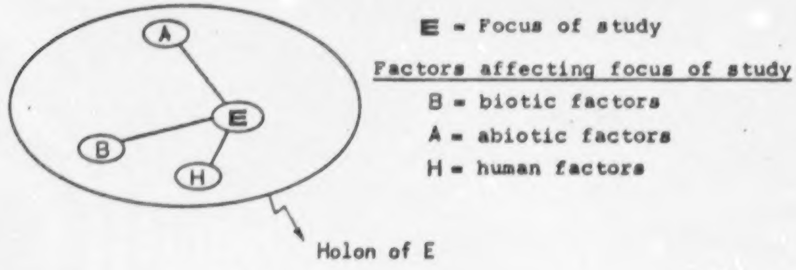
Since these six principles are basic to the success of Environmental Education programmes, they are discussed separately in the sections that follow:

2.4.6 HOLISTIC ENVIRONMENTAL EDUCATION

2.4.6.1 The nature of holistic education

Various observers (e.g. Tinley, 1974; Hungerford, pers. comm.:1981; Winslow, pers.comm, 1981; Stapp, pers.comm. 1981) have pointed out that a major constraint to Environmental Education is the lack of an holistic approach.

Hurry, (1980:52-59) discusses holistic Environmental Education in detail. The holistic approach stresses the fact that the environment is an indivisible "whole". The "wholeness" or "completness" of the environment is more than just a sum of all its parts. He acknowledges that it is impossible to comprehend the total environment in its infinity, and suggests the use of the "holon" concept when dealing with environmental subjects. The holon is an element in the environment which is being studied. It consists of one or more elements and all the factors which influence it. It can be of any size or complexity from a single tree in a wood, to a complete woodland community. (See Figure 4)



E - Focus of study

Factors affecting focus of study
B - biotic factors
A - abiotic factors
H - human factors

FIGURE 4 : THE HOLON CONCEPT

> In this example E could be a tree in a forest. The researcher studies the tree in its environment, and also studies in detail any of the biotic, abiotic or human factors influencing the tree.

The holon is seen as a "whole" within a system of other wholes. Seen from below it in the system it is a self contained whole. Seen from above it, it is a dependent part of another, larger whole.

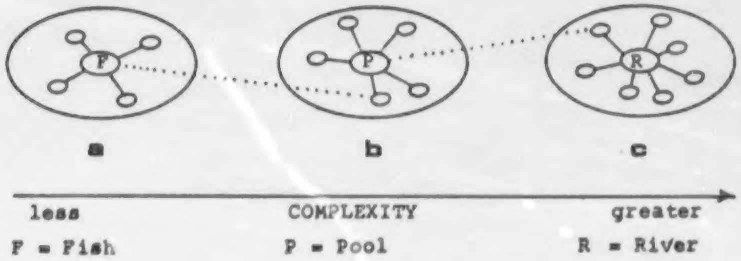


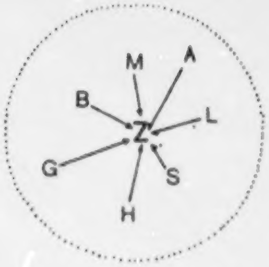
FIGURE 5 : RIVER HOLONS

From Figure 5 an example of a holon at level "a" could be a fish in a river pool. The pool itself is at level "b", while the river in which the pool is found is at level "c".

Holistic Environmental Education is a means to an end and not an end itself. It is a means of encouraging divergent thinking in students. It encourages students to consider all aspects of structures and processes in the environment, (including those yet to be discovered), and discourages the merological (splintered) approach to learning.

Hurry, (1980:56) proposes the following definition of holistic Environmental Education:

> "Holistic Environmental Education is the study of the components of the environment with the aim of building a comprehensive picture of the environment as a whole. In studying the components special reference is made to the relative position of each component within the environment, as well as to the factors which affect, or are affected by, the component being studied."



Z = part of the environment being studied

Information and skills coming from:

Art (A), Mathematics (M), Languages (L), Biology (B), Geography (G), History (H) and Science (S).

——• = Inputs of information & skills

◌ = Holon of topic Z

FIGURE 6 : SOURCES OF INFORMATION AND SKILLS

Figure 6 shows the potential sources of information and skills which might be needed to study an element (e.g. a shrubbery) in the environment. From the figure it is clear than an holistic study of any one element involves information from a variety of sources.

In the case of school education this implies a certain amount of subject integration+. Information (or techniques for obtaining or recording that information) is available from the full range of school subjects.

+ Most researchers in the field of Environmental Education (e.g. Childress, 1978) use the term "multi-disciplinary" to describe a programme in which the subject (discipline) retains its identity, but is utilised to explore broad themes or issues.

"Inter-disciplinary" on the other hand, refers to a programme in which subjects lose their identity. Emphasis is given to the identification and utilisation of any data which will aid in the investigation of a theme or issue.

Several writers have pointed out that subject integration, at different levels of application and according to the needs of the curriculum, is essential if the pupils are to develop an holistic picture of the environment. (e.g. Rimer, 1980:17-30; Hopkins, 1976:25; Millar, 1980:7; Stapp, 1978(a):5; Fensham and May, 1979:15-24; Hungerford and Peyton, 1980:10-11.)

2.4.6.3 Environmental Education - An approach, not a separate school subject

In calling for improved subject integration at school, most educationists are not calling for a break down in the system of separate school subjects, or for that matter the creation of a new school subject known as Environmental Education. Emphasis is placed rather on the fact that all the school subjects have a role to play in developing positive attitudes to the environment, and in achieving the aims and objectives of Environmental Education as set out earlier. (Stapp, pers. comm.; Bogan, pers. comm.; Disinger, pers. comm.; Coon and Bowman, 1976 and Nightingale, 1977).

Coon and Bowman, (1976:15) state:

> "there is very strong agreement among specialists in Environmental Education that new courses added to the present elementary and high school programmes are not what is needed. Rather it is believed that most subject matter courses presently being taught can be used to develop concepts about or attitudes towards environmental concerns..."

Hungerford and Peyton (1980:10-11) describe Environmental Education as a "multi-disciplinary" concept. Environmental Education is infused into other school subjects. Environmental Education must find a place in the aims and objectives of each and every school subject.+

In the proceedings of the first Inter-governmental Conference on Environmental Education organised by UNESCO-UNEP at Tlibisi, (1977, 10) it is stated:

> "Environmental Education is not something tacked on to curricula as a separate discipline or specific subject (in the same way as mathematics, physics or biology) but represents a dimension that must form an integral part of curricula..."

Finally the South African Regional Commission for the Conservation and Utilisation of Soil (SARCCUS) (Rowland, 1974:305) recommends that teaching (of Environmental Education) should not be confined to a specific school subject, but should be closely co-ordinated and integrated into the languages, arithmetic, mathematics and the natural as well as the social sciences - in other words the whole curriculum.

+ Since the fundamental aim of Environmental Education is to maintain the quality of the Earth's life-support systems, it follows that in Environmental Education Ecological and Geographical information will be more emphasised than, for example Historical information. The fact that Environmental Education involves many disciplines means that all (school) subjects may be used as vehicles for Environmental Literacy, but not all will receive the same emphasis in achieving this goal.

2.4.7 The importance of local environmental studies

A number of writers have stressed the basic didactic principle of environmental teaching (e.g. Engelbrecht and Lubbe, 1978:12-21; Duminy and Söhnge, 1980:46-47).

According to this principle the local environment must be used as a major source of information and inspiration in the didactic situation. The child is reared in a particular environment with which he is interacting constantly. The information that he receives is largely diffuse and unarranged, and it is the teacher's task to help him arrange the information coherently, while at the same time extending his knowledge of it.

This principle is linked to another educational principle, namely going from the known to the unknown, which stresses the fact that knowledge can only be expanded and developed if it is based on known information (Engelbrecht and Lubbe, 1978:19).

Most writers on Environmental Education agree that the local environment should provide the base on which future environmental knowledge should be developed. The Scottish Education Department writes:

> "The local environment is the most important resource outwith the school. Its character largely decides the pattern of the out-of-school activities which are to be included in a programme of environmental education..." (1974:22)

Stapp and Cox,(1979:14) state that effective Environmental Education programmes should "focus on current and potential environmental situations...within the learner's own community..." They go on to say (op. cit.):

> (Environmental Education) "should utilise diverse learning environments and a broad array of educational approaches to teaching and learning about and from the environment with due stress on practical activities and first-hand experiences..."

2.4.8 The importance of fieldwork in Environmental Education

Various writers have also stressed the need for fieldwork in the local environment if Environmental Education is to be effective (e.g. Berry, 1979:123-126; Nightingale, 1977:10; Jernigan and Wiersch , 1978:30-35 and Fisher, 1978:2.).

Hurry, (1980:59-61) bases a list of arguments in favour of fieldwork as an integral part of Environmental Education on the work done by Nightingale, (1977:22-23) These may be summarised as follows:

- Fieldwork provides a training in the accepted methodologies of the natural sciences. It is a scientific method of investigation.
- Fieldwork is an important means of developing the critical faculties of learners. By obtaining information at first hand they are able to record data and to hypothesise on the data collected.

- Fieldwork develops an understanding of the terms and concepts which the learners have heard in the classroom. Concrete examples in the field provide the learner with a ready frame of reference and assures common standards of comparison within a group. In this way fieldwork reduces the risk of misconceptions of environmental terms.
- Fieldwork generates interest in a subject. Learners are stimulated by their activity in the "real world".
- Fieldwork provides training in intelligent observation. It is not enough for a child merely to see things in his environment. He should be able to comprehend the patterns of elements and interactions which occur at different levels of complexity around him.
- Children learn best by doing. Fieldwork provides the vehicle for activities through which the child learns more about his environment.
- Fieldwork enables learners to work at their own pace. Learners are motivated to work because of this.
- Fieldwork helps develop a concerned interest in the environment.
- Fieldwork provides meaningful experiences for the learner. The learner is able to use all his

faculties during the experience. This gives the learner confidence in his own ability, and may contribute towards the development of his personal autonomy.

- Fieldwork may contribute towards the sociological development of the learner. It may lead to improvements in interrelationships within the pupil group as well as between the teacher and the pupil.

2.4.9 Active participation in solving environmental problems and preventing new ones.

Numerous writers have pointed out that if Environmental Education programmes are to be effective then learners should be involved with the analysis of local environmental problems, and in strategies towards their solution.

Coon and Bowman, (1976:17) wrote:

> (Environmental Education) should help children develop the habit of personal involvement in assuming responsibility for environmental improvement...

They go on to suggest that involvement with local problem-solving develops habits of personal involvement which last until adulthood.

Blackbourn (1976:77) describes problem-solving programmes in German schools, most of which are based on local problems. He cites the example of primary schools in the Ruhr industrial complex which do an inter-disciplinary course based on the local environment.

Blackbourn concludes that the courses

> "should produce a student, who is not only concerned about the environment, but also well informed on methods of preserving it for future generations...."

Berry, (1979:50) states that

> "no man or woman has the right to consider himself or herself an educated person until he or she understands something about the world in which we live, what harm we are doing to the world, and what we can do to save it."

Stapp, (1977:37) gives as a goal for Environmental Education

> "the preventing and solving of environmental problems."

The United States Department of Health, Education and Welfare say that the process of Environmental Education

> "helps the learner perceive and understand environmental principles and problems, and enables him to identify and evaluate the possible alternative solutions to these problems and to assess their benefits and risks..."
>
> (Saveland, 1976:12).

Finally, the Belgrade Charter, produced as a result of the International Workshop on Environmental Education at Belgrade, 13-22 October, 1975, lays down certain guiding principles for effective Environmental Education. Principles 4 to 8 are relevant to this discussion (UNESCO-UNEP, 1976:2):

(Environmental Education should):

- emphasise active participation in preventing and solving environmental problems.

- examine major environmental issues from a world point of view while paying regard to regional differences.
- focus on current and future environmental situations
- examine all development and growth from an environmental perspective.
- promote the value and necessity of local, national and international co-operation in the solution of environmental problems.

2.4.10 An internal locus of control as a pre-requisite for the achievement of Environmental Education goals.

Most educational efforts to produce Environmentally Literate citizens have been largely based on the postulate that a linear relationship exists between knowledge, attitudes and behaviour. Accordingly most Environmental Education programmes assume that knowledge of ecology and/or environmental issues will naturally lead to the desired attitudes and, most important of all, to the desired environmental behaviour.

Peyton and Miller (1980:1-27) point out that the relationships between knowledge, attitudes and behaviour are far more complex than previously assumed. According to recent research increased awareness and/or knowledge of environmental matters does not necessarily lead to positive attitude formation or environmentally ethical behaviour.

Peyton and Miller make the point that if an individual perceives that he is able/unable to bring about change through

his own action, this perception will affect his behaviour. This perception is therefore an additional variable in any educational process, particularly with regard to Environmental Education where a major goal relates to the behavioural domain.

Peyton and Miller have used the term "locus of control" in discussing this additional variable. Those factors which the individual believes he cannot control are referred to as "external controls", those that he feels he has some control over are referred to as "internal controls". For example a teacher may see the locus of control as external in the case of a syllabus which he has to follow for a particular subject but as internal for the methods that he uses to teach it.

With regard to Environmental Education programmes Peyton and Miller are of the opinion that the more the educand feels that the locus of suggested behaviour is internal as opposed to external, the greater the chance that the programme will achieve its behavioural goals.

The implication of locus of control for Environmental Education is obvious. Whenever issues are discussed which pose problems or suggest action by the man in the street (whether he be a school child, a trainee teacher or any other adult in the community), every effort must be made to encourage the learner to see himself as part of that action.

Furthermore the implication is that, if the teacher is to reinforce positive environmental attitudes in the learners, particularly with regard to problem-solving, then he should choose problems about which the learner can do something. For example:

When discussing the problem of waste disposal in an urban environment, the teacher could run a mini waste-disposal programme - sorting out glass, aluminium and other recyclable materials from bio-degradables such as paper and vegetable peels. The pupils could sell the re-usable materials and make compost from the bio-degradable materials. In this way they would begin to identify with the problem and to consider ways in which they might contribute to its solution.

2.4.11 Values clarification

It has been stressed that a problem-solving approach should be used in Environmental Education. It has been stressed also that learners must be able to feel some measure of control over problems if they are to be encouraged to solve them.

Stapp and Cox, (1979:16-17) point out that in order to solve problems one needs to get to their root causes, not try to treat their symptoms. They also point out that the life style of individuals may well be the root cause of an environmental problem.

Simon et al, (1972:54) state the case strongly when they say:

> "At the root of what is wrong today with today's children and our own lives as well is a colossal vacuum in the whole realm of values. Almost none of us has a clear idea of what we want, where we are going, why we are going there, who is going with us, and even who we are... I feel more and more strongly that in fighting our malaise the most severe problem facing all of us is HOW TO GET PEOPLE TO LOOK AT THE LIVES THEY ARE LEADING."

An example of values clarification which could form part of Environmental Education concerns visible air pollution. In everyday life learners see visible pollution (symptoms) produced by technology in its efforts to create and satisfy consumer demands (root cause). Since the learners are involved in consumer cycles which are stimulated by advertising, it is important for them to examine their way of living. The learners need to be guided through a valuing process where they explore the consequences of individual actions, and where they learn to generate ideas for alternative behaviours that would bring them into a more compatible way of living within the environment.+

Learners begin to develop their own set of values, when they start to consider alternatives, the consequences of alternatives, and their personal feelings towards each alternative before they act.

Stapp and Cox (op. cit:16) discuss the processes by which individuals arrive at values. Six steps may be identified which assist the learner in clarifying his values. They are:

- The learner is presented with an environmental problem.

+ For further discussion and examples on values clarification see Appendix E.

- The learner analyses the problem into its component parts. (The problem is stated. To whom is it a problem? Why is it a problem? What actions have been suggested to solve the problem? What consequences would these actions have on (a) the problem and (b) the community or sections of the community? What about those components of the problem that are not yet visible, and which might crop up at a later stage?)
- The learner suggests alternative solutions to the problem.
- The learner considers the consequences of each alternative.
- The learner must be encouraged to express his feelings about each alternative.
- The learner must make a free choice of the best solution as he sees it.

The values clarification approach helps learners become aware of personal beliefs, attitudes, values and behaviours which they prize, and are committed to, both inside as well as outside the classroom. The process assists the learners in considering alternative actions regarding issues, and the implications of each action.

Bowman and Hanselman, (1979:5-6) discuss seven "golden rules" to consider whenever value systems are being dealt with in class. They are:

- Choices of actions must be made freely. Any choices made under pressure are not likely to last.
- Alternative actions must be available. It makes no sense asking a child to make a choice about breathing. He has no choice in the matter. Activities linked to values must have alternatives.
- The choice of actions must be made after careful consideration. Impulsive or whimsical choices are not part of valuing. The consequences of alternative actions must be weighed so that an enlightened choice can be made.
- The values must be prized and cherished. Something that is valued must be held in esteem. The feelings of the learners as well as their intellects must be brought into play.
- The learners must be prepared to affirm their actions publicly. They must be prepared to champion the cause should it be necessary.
- The learner must act according to the values he expresses. One of the most important roles of the teacher with regard to values clarification is to help the learner to consider whether his actions are congruent with his stated beliefs, attitudes and values.
- The repetition of actions reflecting values, indicates the permanence of those values. By encouraging actions which are congruent with stated values, the teacher is assisting in making those values more permanent.

Values clarification is of major importance in making rational day-to-day decisions which might affect the environment. It is a vital component in ensuring citizen participation in the solving of environmental problems.

2.5 TARGET GROUPS FOR ENVIRONMENTAL EDUCATION

Environmental Education relates to all members of the community.

The recommendations from the first Inter-governmental Conference on Environmental Education at Tbilisi included the following: (Smyth, 1977:78)

> "Environmental Education should be provided at every age and at all levels of formal education for pupils and teachers, and in various non-formal educational activities for young people and adults...."

The Belgrade Charter describes the target groups of Environmental Education as follows (UNESCO-UNEP, 1976:2):

> "The principal audience of environmental education (sic) is the general public. Within this global frame the major categories are:
>
> 1) The formal education sector: including pre-school, primary, secondary and higher education students as well as teachers and environmental professionals in training and retraining;
>
> 2) The non-formal education sector: including youth and adults, individually or collectively, from all segments of the population, such as the family, workers, managers and decision makers, in environmental as well as non-environmental fields....."

The 1967 conference of the Southern African Regional Commission for the Conservation and Utilisation of the Soil (SARCCUS) recommended that Environmental Education should be provided for formal education (schools and teacher-training colleges), youth movements and for adults (Rowland, 1974:328).

2.6 SUMMING UP DISCUSSION ON ENVIRONMENTAL EDUCATION

2.6.1 The use of the metaphor "Spaceship Earth" is appropriate since the Earth has a limited life support capability.

2.6.2 The basic goal of Environmental Education is to produce an Environmentally Literate citizenry which will care for Spaceship Earth.

2.6.3 Environmental Literacy involves:

- Awareness of the total human environment
- Knowledge of environmental problems
- Attitudes and values which lead to positive environmental behaviour
- Participation in solving or preventing environmental problems.

2.6.4 The six guiding principles of Environmental Education are:

- Environmental Education should be holistically taught.
- Learners must have a knowledge of the local environment.

- Fieldwork is essential for effective Environmental Education.
- Learners should be involved in problem-solving situations.
- There should be an internal locus of control with regard to problem-solving.
- Values clarification must be part of the educational process

(For a practical example of a school that satisfies most of these guiding principles see Appendix D.)

2.6.5 Environmental Education is not aimed at a particular group, but at everyone in the community.

2.7 CHAPTER SUMMARY

2.7.1 Environment

The human environment has three basic components, namely the physical, the biological and the cultural. There is a close interrelationship between man and his total environment.

2.7.2 Education

The basic aim of education is to lead the individual into a responsible relationship with his total environment. Education should lead to the development of personal autonomy in the individual.

2.7.3 Environmental Education

Environmental Education focuses on those educational processes which lead to the acquisition of attitudes and values which reflect a concern for the health of the environment. Environmental Education leads to behaviour patterns which are congruent with those attitudes and values.

CHAPTER THREE

TEACHER-TRAINING AND ENVIRONMENTAL EDUCATION

1 : THE LEARNING-AND-RESPONDING MODEL

> "Environmental Education is no passing whim, no educational fad, no frill. It is, or ought to be, a new focus on the entire educational process. It should infuse curriculum at every level ..."
>
> Mary Berry 1979

The pressing need for environmental education

CHAPTER THREE

TEACHER-TRAINING AND ENVIRONMENTAL EDUCATION

1 : THE LEARNING-AND-RESPONDING MODEL

3.1 INTRODUCTION

The nature of school education is discussed in section 2.3. In that section it is pointed out that most people assume that citizens who have been through the South African educational system will conduct themselves in a rational manner and in the best interests of South African society. It is also suggested that the educational system, by affecting changes in young people, could be a force for generating change in South Africa.

Today many people are challenging the assumptions that educational systems produce "good citizens", or that the citizens they produce are a "force for generating change". Particularly in the case of Environmental Education sceptism has been expressed regarding the ability of the educational system to produce Environmentally Literate citizenry with the knowledge, motivation and skills to work towards a socio-cultural milieu whose behavioural patterns will reflect recognition and acknowledgement of the limited capabilities of the earth's life-support system (Tinley, 1974:4; Hopkins, 1977:6; Stapp, 1978(a):5).

3.2 TEACHER - TRAINING : THE BASIS FOR EFFECTIVE ENVIRONMENTAL EDUCATION.

3.2.1 The background

A number of writers have expressed the view that without well trained and well motivated teachers, the best designed school facilities, instructional materials and curricular programmes will not lead to successful Environmental Education (E.g. Stapp *et al* 1980:1; Saveland, 1976:228-231).

In a previous study Hurry, (1980) identified a number of problem areas with regard to Environmental Education in Transvaal Secondary Schools. According to Hurry a major constraint to Environmental Education is that teachers are inadequately trained at both the pre-service as well as the in-service level.

Irwin, (1982:271-276) agrees with Hurry. He is of the opinion that teacher-training in Environmental Education in South Africa is "almost non-existent" (op.cit:273). He believes that the majority of teachers who are effective in Environmental Education are "mostly self-motivated and self-trained".

The need for effective teacher-training was highlighted at the Inter-governmental Conference on Environmental Education, mentioned earlier. Seven recommendations regarding teacher-training were adopted at this conference. They are given here, since they represent the considered opinion of over 70 nations: (Stapp *et al*, 1980:2-3).

- that environmental sciences and environmental education be included in curricula for initial teacher education;

- that the staff of teacher education institutions be assisted to bring this about;
- that teacher education institutions include in courses of pre-service training of teachers, research methodologies for designing and developing methods and instruments which enable teachers to effectively fulfill (sic) the objectives of environmental education (sic);
- that teachers in training should be given an understanding of as wide a range as possible of educational materials and aids, with special reference to low-cost materials and opportunities for adaption in local circumstances;
- that teachers receive appropriate environmental training relating to the area, either urban or rural, where they are going to work;
- that teacher-training institutions should have the necessary flexibility to enable them to include appropriate aspects of environmental curricula that meet the requirements of an interdisciplinary approach and methodology;
- that teacher-training institutions undertake research in order to develop low-cost educational methods and materials enabling educators to train or retrain themselves on their own.

3.2.2 A two-pronged approach to teacher-training

From the above list it can be seen that there are two sets of processes to be considered with regard to the education of teachers for effective Environmental Education. One set relates to the preparation of Environmentally Literate teachers, while the other relates to the training teachers should receive for themselves to be effective in Environmental Education. In this study the former is discussed separately as "learning-and-responding", while the latter is dealt with as part of the complete "teacher-training" programme. Both sets of processes are closely interrelated, with "learning-and-responding" being an integral part of "teacher-training".

3.2.3 Whose responsibility?

This study has emphasised the fact that Environmental Education is NOT a separate school subject, and that teachers of all school subjects have a role to play in developing Environmental Literacy in school children.

A corollary to this is that all school subjects should be used as vehicles for Environmental Education - some more than others. For this reason this study is concerned with ALL primary school teachers, no matter what their areas of specialisation.

3.3 MODELS OF TEACHER-ORIENTATED ENVIRONMENTAL EDUCATION PROGRAMMES

3.3.1 Models of educational structures and processes

According to Collins et al, (1973:137) models are used in the formulation of theories. The word model denotes the illustration of a theory by three-dimensional constructions, by diagrams, by mathematical symbols or by verbal propositions. The purpose of the model is to make clearer and more intelligible a complex theoretical formulation by structuring it and creating analogies.

Haefele, (1968(a):99-100) stresses the importance of teacher-training programme models. He points out that models encourage situation analyses; They furnish references for making curricular and tangential decisions. They are also characterised by a rigorous and permanent endeavour to collect and evaluate feedback data and to adjust to feedback demands.

LeBaron and Klatt, (1971:30-31) list six characteristics of an effective model for teacher education. These are:

- The model must be complete. It must explain the whole system.
- The model must reflect an operational reality. Each part of the model must not only function on its own, it must be in empathy with the rest.
- The model must be understandable. It should describe the system in a straightforward, unambiguous manner.
- The model must show a relation between its concerns and the concerns of related systems. For example a model for teacher-training should show the relation between teacher-training and the educational system of which it is a part.

- The model should encourage analysis. Models should show both structures and processes, so that analysis can take place.

- The model should encourage feedback. Effective models must be responsive to the information from their operation and from their environment. Information from the operation is fed back into the system.

For the purposes of this study, models that are described as verbal propositions are referred to as verbal models

Models of education which are used for discussion and/or comparison are given in diagrammatic form. These are referred to as synoptic models. Synoptic models are preferred to verbal models as they give a clearer "overview" of the structures and processes contained in them.

3.3.2 The need for synoptic models

In section 3.2.2 it was established that there are two sets of processes to be considered in training teachers for effective Environmental Education. During "learning-and-responding" processes of training, students are trained to be Environmentally Literate, while during the "teacher-training" processes, they are trained to teach Environmental Education effectively. Both sets of processes are closely interrelated, with the former being considered an integral part of the latter.

Since one of the goals of this study is to assess the status of Environmental Education in Transvaal primary school teacher-training programmes, it has been necessary

to develop synoptic models of both the learning-and-responding part of the programme as well as of the complete teacher-training programme. These models, which are discussed in this chapter and in the chapter that follows, are used as yardsticks in the assessment process.

3.4 LEARNING-AND-RESPONDING MODELS OF ENVIRONMENTAL EDUCATION

3.4.1 A basic model for school education

In order to develop a learning-and-responding model for trainee teachers, it is first necessary to discuss Environmental Education at schools.

A number of writers have discussed learning-and-responding models for school Environmental Education (e.g. Stapp and Cox, 1979; Saveland, 1976; Harvey, 1977).

A synoptic model which forms a useful basis for discussion is that of Stapp and Cox, (1979:24) which these researchers have based on the metaphor of "Spaceship Earth". (See also section 2.4.1). This model is described as "action orientated" and would fit any formal school situation.

The model is based on the eleven guiding principles of the World Inter-governmental Conference on Environmental Education, discussed in section 2.4.5 of Chapter 2.

This model consists of four integral parts. These are: Philosophy and concepts; processes; teaching methods and programme emphases. These four parts are discussed in the sections which follow.

3.4.1.1 Philosophy and concepts

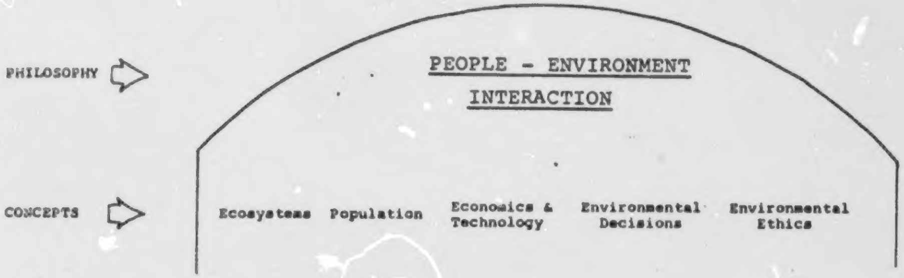


FIGURE 7 : ENVIRONMENTAL EDUCATION MODEL - PHILOSOPHY AND CONCEPTS

Stapp and Cox refer to the philosophy and concepts part of the model as the "big ideas" of the model. The basic philosophical goal of Environmental Education relates to a healthy "people-environment interaction." It is the growth and development of a "Spaceship Earth" philosophy.

The concepts that need to be developed to achieve this basic philosophy relate to ecosystems, population, economics and technology, environmental decisions and environmental ethics.

The concepts leading to the development of the "Spaceship Earth" philosophy are built up gradually from class level to class level. Since they are basic concepts they should be integrated into all parts of the school curriculum.

3.4.1.2 Processes

According to Stapp and Cox there are four sets of processes contributing to the development of the environmental concepts. These are processes relating to: environmental knowledge, environmental skill development, values clarification and environmental encounters.

These processes reflect the objectives for Environmental Education, discussed in section 2.4.3. In that discussion the point was made that objectives in the affective domain outnumbered those in the cognitive or psychomotor domains in Environmental Education.

a. Environmental knowledge

Environmental knowledge is best acquired through environmental experience. It includes not only environmental facts, but the knowledge necessary to find those facts or interpret them. This process involves mainly the cognitive domain.

b. Skill development

It was established in section 2.4. 9 that to produce an Environmentally Literate population it is essential to assist the learner in obtaining skills for resolving environmental problems, as well as to provide environmental knowledge and to motivate concern.

These processes involve the cognitive, affective and the psychomotor domains of educational objectives.

Stapp and Cox list nine skills which would be used in problem-solving. These are linked to the ability to:-

- Recognise environmental problems
- Define environmental problems
- Listen with comprehension
- Collect information
- Organise information
- Analyse information
- Generate alternate solutions
- Develop a plan of action
- Implement a plan of action

c) Values clarification

In section 2.4.11 the point was made that values clarification is essential to Environmental Education.

Stapp and Cox also stress the importance of values clarification. They point out that, in order to solve Environmental problems it is essential to get to their root causes. The learners need to examine their way of life. They need to be guided through a valuing process where they explore the consequences of every day individual actions.

The learners begin to develop their own set of values when they start to consider alternatives, the consequences of alternatives, and thier own personal feelings towards each alternative, before they act.

The critical role of the teacher is to help each learner to consider whether his stated beliefs, attitudes and values are congruent with his actions. This process involves the affective domain of educational objectives.

d) The environmental encounter

The importance of fieldwork was stressed in section 2.4.8.

The environmental concepts, problem-solving skills and the values clarifications process are integrated in the fieldwork situation which Stapp and Cox refer to as the environmental encounter.

It is during the environmental encounter that the learner is able to experience problem-solving at first hand. Without this experience it is doubtful whether the learner will ever become involved in day to day issues in his own community.

The environmental encounter involves the cognitive, affective and psychomotor domains of educational objectives.

3.4.1.3 Teaching-learning situations

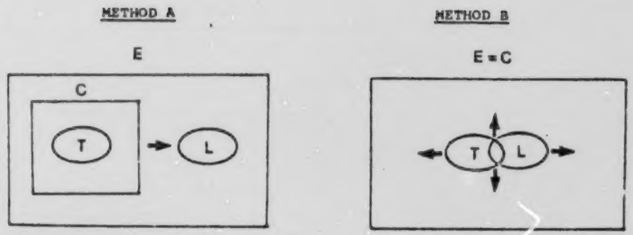


FIGURE 8 : ENVIRONMENTAL EDUCATION MODEL - TEACHING - LEARNING SITUATIONS

Stapp and Cox discuss two types of teaching-learning situations. In method A the teacher (T) is a conveyor of information. He assumes little responsibility for the content (C) of the lesson. To a large extent he accepts that the syllabus has been determined by subject committees or other administrative bodies, and that he has little to add to or subtract from it. The teacher becomes familiar with the information to be imparted, and then assumes the role of expert in conveying the information to the learner (L).

Because of the attitude of the teacher the environment (E) is seen frequently by the teacher and pupils as being "outside" of the classroom. It does not appear to be linked to the work being done in it. This method encourages a linear, uni-directional relationship between the teacher and the learner.

In method B the teacher is more of a councillor than a lecturer. He participates to a greater or lesser extent in the selection of the content material for each lesson.

With this method the learner participates more in the acquisition of knowledge. The teacher is more of a facilitator or guide than a lecturer. There is a constant interaction between the teacher and the learner.

The environment becomes part of the learning situation, and events in the environment may lead to changes in the contents of lessons. The teacher and the pupils interact continuously with the environment.

3.4.1.4 The programme emphases

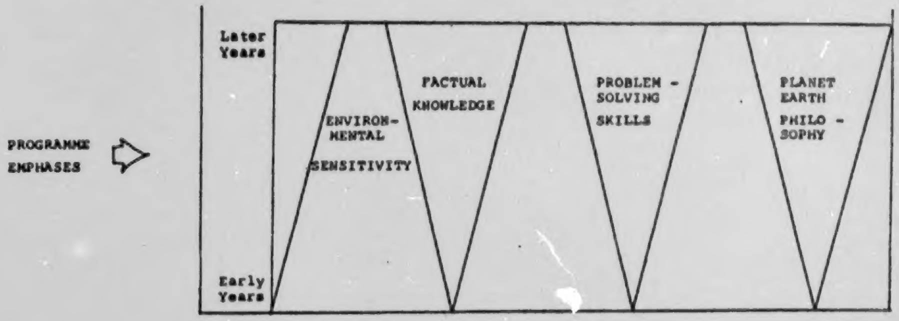


FIGURE 9 : ENVIRONMENTAL EDUCATION MODEL - THE PROGRAMME EMPHASES

The programme emphases may be described as the throttle regulators for the entire programme. To begin with the emphasis is more on developing a sensitivity to the environment, than on factual knowledge, problem-solving and the development of a Planet Earth philosophy. As the programme develops the emphasis changes, with the former element receiving less attention and the latter more.

Figure 10 shows the complete synoptic model of Stapp and Cox, containing all the elements discussed in this section. To emphasise the use of the metaphor "Spaceship Earth" Stapp and Cox enclose these elements in an outline of a spaceship, with the "Philisophy" in the nose-cone and the "Programme emphases" as the rocket boosters.

3.4.2 A model showing subject integration

It has already been established (in section 2.4.6.3) that Environmental Education is NOT a separate school subject, and that it should be woven into the fabric of all school subjects, just as should good manners and acceptable social behaviour.

The model of Stapp and Cox may be altered to include reference to subject integration within the school curriculum.[+]
At the same time the model can be added to to reflect the position of an Environmental Education co-ordinator (Eeco-teacher) in a typical South African school.

3.4.2.1 Guiding principles

The model is based still upon the eleven guiding principles of the World Inter-governmental Conference on Environmental Education (discussed in section 2.4 5.).

[+] The use of the term "subject integration" was explained in a footnote in section 2.4.6.3.

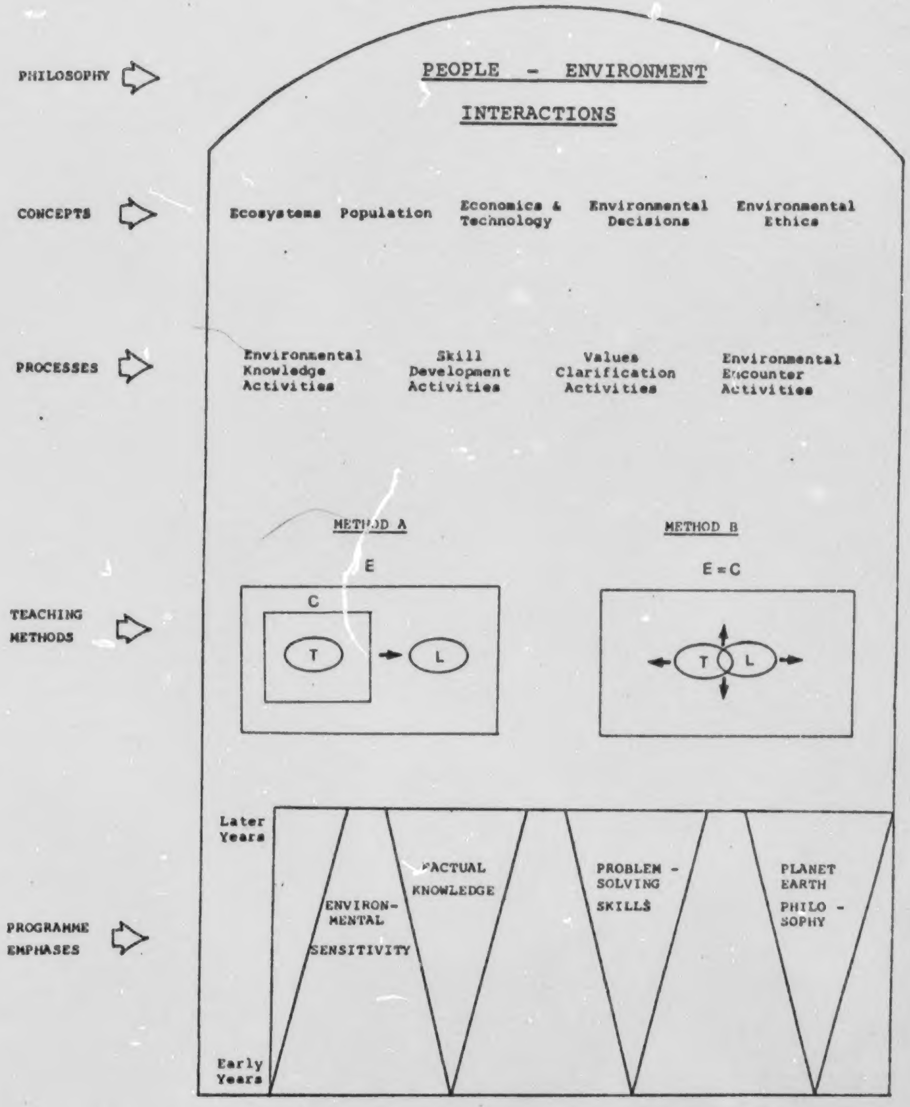


FIGURE 10 : AN ENVIRONMENTAL EDUCATION MODEL FOR SCHOOLS
(Stapp and Cox, 1979:24)

3.4.2.2. Philosophy and concepts

The basic philosophy in the model remains orientated towards a healthy people-environment interaction. This also may be described as a "Spaceship Earth" philosophy.

The term "Environmental Literacy" (as discussed in section 2.4.4) is used to describe the five basic concepts of Stapp and Cox.

3.4.2.3 Processes

a. Problem-solving activities are added to the list of processes which contribute to Environmental Literacy. These are listed separately to emphasise their importance as a separate set.

Stapp and Cox, (1979:17) emphasise the importance of developing problem-solving skills in young people. According to them the learner should have the opportunity of becoming personally involved in positive action through the following recommended steps:

- Defining the problem or issue
- Becoming informed
- Identifying alternative solutions
- Evaluating alternative solutions
- Developing a plan of action
- Implementing the plan of action
- Evaluating the implementation

Each problem-solving situation should have a list of behavioural objectives which provides direction for the learning process. This controlled and structured approach to problem-solving ensures that it is an integral part of the general education process.

b. The environmental encounter provides opportunity for the learner to acquire knowledge of the local environment at first hand, to exercise practical skills such as interpretation and statistical analysis, and to gain experience of problem-solving in the "real" world.

3.4. 2.4 Teaching-learning situations

In Figure 11 "teaching methods" have been replaced by "didactic situation". Method B of Figure 10 has been selected as the ideal teacher-learner situation.

3.4.2.5 The approach to the programme

The model has been changed also insofar as the general approach to school teaching is concerned. It now shows the integration of Environmental Education in various school syllabuses. It emphasises the fact that Environmental Education is part of the basic school curriculum. Each school subject has a role to play, to a lesser or greater extent, in developing Environmental Literacy in school children.

(in most schools the emphasis would be more on multi-disciplinary activities, than on those of an inter-disciplinary nature.+1 +2).

+1 The terms "multi-disciplinary" and "inter-disciplinary" are defined on page 49.

+2 For a practical example of an inter-disciplinary school programme see Appendix D.

3.4.2.6 The Environmental Education Co-ordinator (Eeco-teacher)

In order to ensure effective subject intergration in all school subjects, an Environmental Education Co-ordinator (Eeco-teacher) should be appointed. This post should be held in a part-time capacity. The Eeco-teacher should be someone with some knowledge of Environmental Education, theory and practice. A Science teacher would be well suited to the post.[+]

The functions of the Eeco-teacher would be to:

- Ensure that Environmental Literacy is one of the basic aims of the school programmes at each grade level of the school.
- Help co-ordinate the environmental studies undertaken by the different classes; for example, an ecological investigation of the school grounds for a Standard 4 class. (The Eeco-teacher would use the expertise of different teachers in the school, or may even bring in outside assistance.)
- Advise teachers on resources materials for both themselves and their pupils.
- Keep records of resources that teachers or pupils might find helpful in Environmental Education and if possible keep copies of worksheets and other similar resources for use by teachers.

3.4.2.7 The programmes emphases

The programme emphases continue to act as the programme "throttles". Environmental sensitivity requires less and

less emphasis, whereas factual knowledge, problem-solving skills and the development of a "Spaceship Earth" philosophy receive more emphasis as time goes on.

Figure 11 shows the model as it has been adopted from Stapp and Cox. Note that the elements are still enclosed in the outline of a spaceship to emphasise the use of the "Spaceship Earth" metaphor.

3.4.3 The learning-and-responding model for student teachers

3.4.3.1 The need for Environmentally Literate teachers

In Section 3.1 it was pointed out that the success or failure of Environmental Education programmes depended entirely on the interests and abilities of the teachers.

Teachers are at the helm of education. Effective teaching programmes rely on effective teachers. Numerous writers have discussed the qualities of an "effective teacher". Bone, (1978:5-6) mentions the possession of personal skills, knowledge, and attitudes. Seymour, (1978:6) states that a good teacher "understands the needs and abilities of the ... school child and appreciates their individual differences..." Thompson, (1978:7) describes a good teacher as "one who understands and appreciates the social and organisational setting in which the educational process takes place." Cleary, (1976:230-231) emphasises that in education generally, but particularly in Environmental Education, teachers need to be models for children. He stresses that Environmentally Literate teachers must be "willing to conserve pencils as well as time, to turn out lights in empty classrooms, and to recycle re-usable classroom materials...."

[+] For a practical example of a school Eeco-teacher see Appendix D

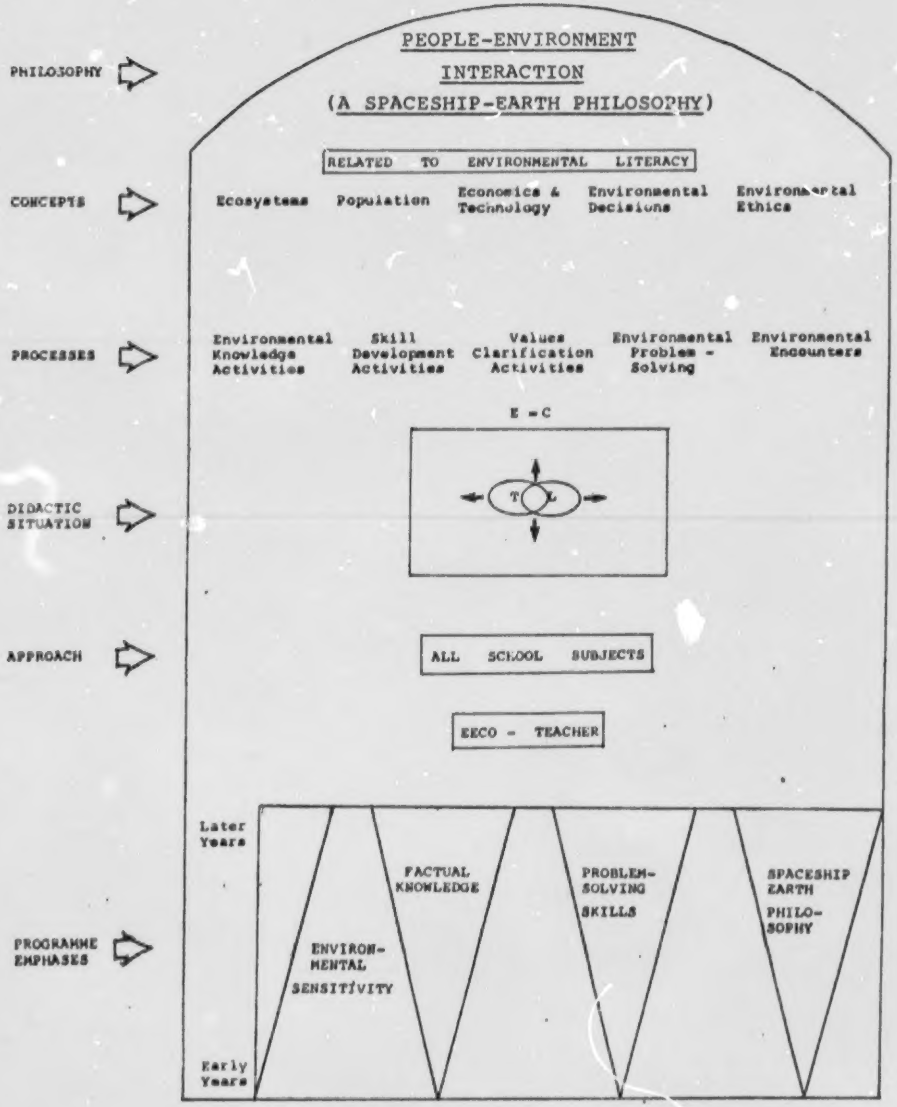


FIGURE 11 : A MODEL FOR SCHOOL ENVIRONMENTAL EDUCATION
(SHOWING SUBJECT INTEGRATION)
(Adapted from Stapp & Cox, 1979:24)

Most researchers in Environmental Education agree with Cleary (e.g. Rentsch, 1973:4; Hibbs, 1975:85; Agne and Nash, 1976:141). Stapp et al, (1980:1) state that "without well trained and motivated teachers, the best designed physical facilities, instructional materials and curricula programs (sic) will not lead to successful Environmental Education."

From the above it may be said that any model for training effective teachers should contain elements which contribute to Environmental Literacy.

In section 3.4, two learning-and-responding models for Environmental Education in schools were discussed. These models may be adapted to produce a model for the student teacher situation.

3.4.3.2 Guiding principles for a learning-and-responding model for student teachers

This model is also based on the eleven guiding principles of the World Inter-governmental Conference on Environmental Education discussed in Section 2.4.5 of Chapter 2.

The model is also based on the seven recommendations on teacher-training of the Tbilisi conference (see Section 3.2.1).

3.4.3.3 Programme philosophy and concepts

The programme philosophy remains orientated towards a positive people-environment interaction. In the learning-and-responding model for student teachers "personal autonomy" is added.

Teachers are expected to be self-actualising with regard to Environmental Education, particularly with regard to dealing with environmental issues.

As in the other two models, the concepts in this model relate to Environmental Literacy. In the case of student teachers this term also implies a willingness to teach Environmental Education effectively.

3.4.3.4 Processes

There are five processes in the model leading to the development of the environmental concepts. These are processes relating to environmental knowledge and skills, values clarification, problem-solving and environmental encounters.

Most courses offered by teachers' colleges should be used as vehicles for these processes. It is essential that as many college courses as possible are involved in these processes to a greater or lesser extent.

* Processes relating to the acquisition of knowledge must relate to the environment as a whole. However, in order to understand and appreciate the interactedness of elements in ecosystems, ecological processes must receive particular attention.

Knowledge of the environment may be acquired through lectures and/or discussions. More important is that it is acquired through direct experiences of the environment (the "environmental encounters").

* Student teachers should acquire all the skills needed to be Environmentally Literate. These should be acquired through direct experience of the environment. These skills are similar to those discussed in Figure 11 and relate to environmental problem-solving. They include interpretive skills, sampling techniques, the pictorial representation of data, mapping and statistical analysis.

* It is important that student teachers receive training in values education. The students must be exposed to various methods designed to assist them in examining their own values and the implications of their actions. Emphasis should be placed on local environmental issues. Students should have the opportunuty to view the local environment at first hand, to attend public gatherings, to gather relevant information, to consider alternative solutions to problems, and to advocate these solutions through the appropriate channels.

* Student teachers should be involved in Environmental problem-solving activities. Particular emphasis should be placed on work in the local environment.

The problem-solving process for student teachers is essentially the same as it is for school pupils (see section 3.4.2.3). The students should be taught how to analyse problems (in general) and how to approach strategies towards their solution. Particular examples should be chosen from local environmental studies.

Examples of local environmental problems which students could investigate and seek solutions for, are:

- Traffic congestion around the college in the early morning
- Pedestrian accidents on the road past the college
- Accumulations of street litter near the college
- The proposed demolition of a local, historically valuable, building

- Fieldwork and/or practical work (the "environmental encounter" discussed in section 3.4.1.2) must be an integral part of any Environmental Education programme. In addition to providing information on the environment fieldwork plays an irreplaceable role in the development of environmental skills and is invaluable for problem-solving.

3.4.3.5 Teaching-learning situations

The typical didactic situation with regard to student teachers involves not only the teacher-learner but also the learner-learner. There is a far greater teaching-learning interaction between peers in student-teacher groups than there is between pupils in groups at schools.

3.4.3.6 The approach to the programme

The approach to Environmental Education is via all college subjects, with particular emphasis on the so-called "content" subjects such as History, Geography and Biology.

The student teachers must be encouraged to adopt an holistic approach to environmental knowledge. Although they may acquire certain knowledge through different courses, they must be aware that an important result of their studies in different departments is insights into, and an appreciation of the environment as a whole.

Notwithstanding the fact that Environmental Education is NOT a separate subject at school (see section 2.4.6.3) it may be necessary to introduce a special course in Environmental Education to supplement the work done by all college departments in developing Environmental Literacy in the student teachers. The course, which would be based on the home-region of the college, would provide information on the bio-physical and cultural environment, as well as develop environmental skills, attitudes and behaviours.

3.4.3.7 The appointment of an Environmental Education Co-ordinator (Eeco-teacher)

Since Environmental Education may not be a separate subject within the teacher-training programme, it is imperative than an Environmental Education Co-ordinator (Eeco-teacher) be appointed to ensure that Environmental Education is comprehensively dealt with (both at the learning-and-responding level and at the subject didactics level).

Accepting that Environmental Literacy is a basic aim of the teacher-training programme, the functions of the Eeco-teacher would be to:

- Ensure that students receive the minimum training in Environmental Education to realise the aim of Environmental Literacy.

- Ensure that key elements of Environmental Education are covered by the teaching departments best suited to each element.
- Encourage both inter-disciplinary as well as multi-disciplinary studies in and between teaching departments.+
- Co-ordinate inter-departmental Environmental Education activities (e.g. fieldwork, World Environment Days, art exhibitions, etc)
- Advise lecturers on sources and resources in Environmental Education, both for themselves and for their students.

The Eeco-teacher's position could be a fulltime appointment. If it is not fulltime then the work should be done by a member of a department such as Biology or Geography.

3.4.3.8 The programme emphases

The programme emphases remain the "throttles" for the programme. Three areas of emphasis that are gradually reduced as the programme gathers momentum are environmental sensitivity, factual knowledge and environmental supervision. Three areas that receive increasing emphasis are problem-solving skills, the development of a "Spaceship Earth" philosophy and reinforcement of attitudes towards positive people-environment interactions.

Figure 12 shows the synoptic learning-and-responding model for student teachers. The elements of the model are enclosed still within the outline of a spaceship to emphasise the use of the "Spaceship Earth" metaphor.

+ See footnote on page 49

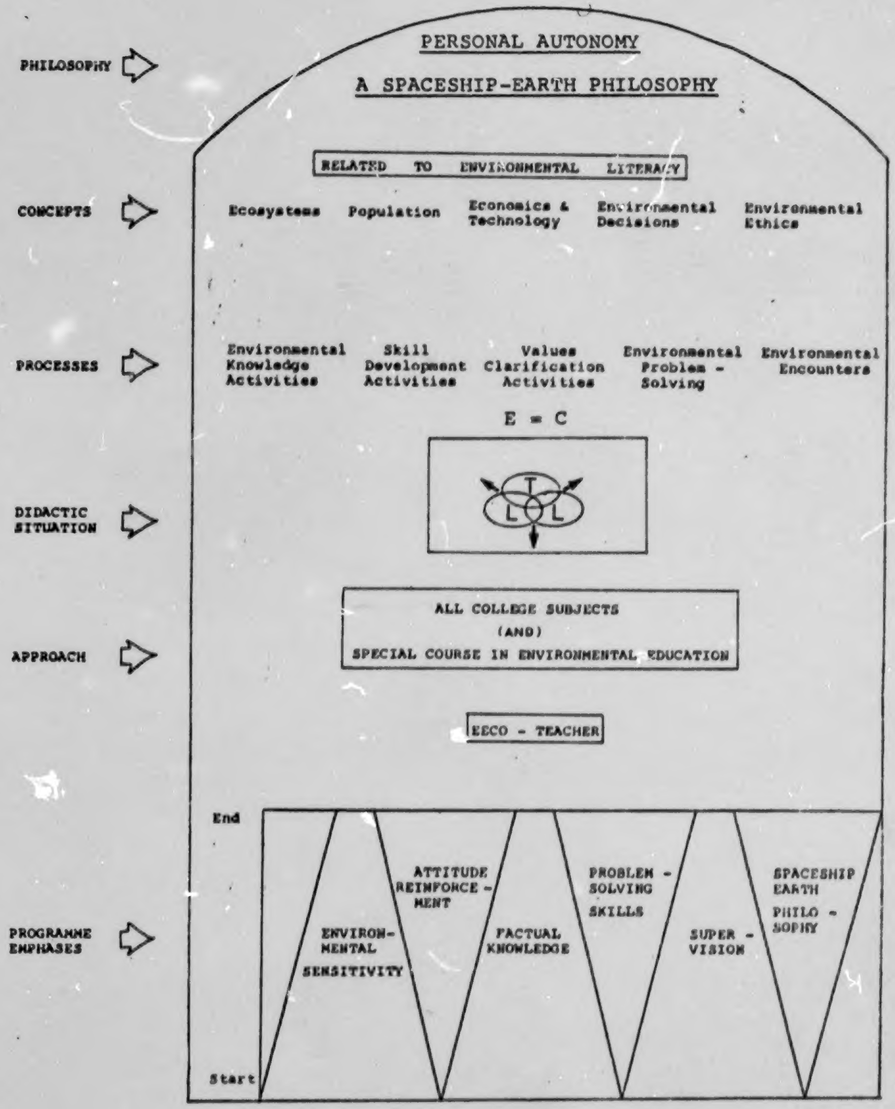


FIGURE 12 : A LEARNING-AND-RESPONDING MODEL OF ENVIRONMENTAL EDUCATION FOR STUDENT TEACHERS

(Adapted from Stapp & Cox, 1979:24)

3.5 KEY ELEMENTS IN THE LEARNING-AND-RESPONDING MODEL

An important part of this study is to assess the Bachelor of Primary Education programme at four colleges in the Transvaal. In order to do this certain key elements have been identified in the learning-and-responding model.

These key elements are identified as being of fundamental importance in teacher-training and are used in the assessment of the B.Prim.Ed. programmes:

1. Environmental Literacy (as defined in this study), should be a basic aim of the programme.
2. There should be a co-ordinator for Environmental Education (Eeco-teacher).
3. Learners should be exposed to holistic teaching.
4. The programme should provide basic information on the total human environment, with special emphasis on bio-physical elements.
5. Learners should be trained in fieldwork and/or practical work techniques.
6. The programme should deal with values education.
7. The programme should develop problem-solving abilities in the learners.
8. The programme should involve the learners in local issues as an exercise in problem-solving.

3.6 CHAPTER SUMMARY

3.6.1 Researchers in different parts of the world have stressed the role of the teacher in ensuring the effectiveness of Environmental Education programmes.

Teacher-training is identified as the first priority in education.

3.6.2 Two types of theoretical models are discussed. The first, the verbal model, is a model in which the structures and processes are explained in print. The second, the synoptic model, is a model in which a diagram is used to display the structures and processes. The synoptic model is preferred in this study since it gives an overview of the programme and this emphasises the holistic approach.

3.6.3 There are two sets of processes for Environmental Education in teacher-training:

- The first, known as "learning-and-responding", relates to the development of Environmental Literacy in students.
- The second, known as "teacher-training", relates to the training students must receive to teach Environmental Education effectively.

3.6.4 Effective learning-and-responding programmes for school education are discussed. These are used to develop the learning-and-responding model for student teachers.

This model has five components. These are: philosophy and concepts; processes; the didactic situation; the approach and the programme emphases. Each component is discussed in detail.

3.6.5 Eight key elements from the learning-and-responding model are identified. These will be used, together with the key elements from the teacher-training model, to assess the training programmes of ***selected Transvaal colleges.***

CHAPTER FOUR

TEACHER-TRAINING AND ENVIRONMENTAL EDUCATION

2 : THE TEACHER-TRAINING MODEL

> "In my judgement, teacher education represents
> the most effective approach for reaching an
> entire nation and affecting the skills,
> knowledge and attitudes of its people .....
> In a real sense, as teacher education goes,
> so goes the nation ..."

C.J Manone 1970

Promising prospects in Eastern African
Teacher Education.

CHAPTER FOUR

TEACHER-TRAINING AND ENVIRONMENTAL EDUCATION

2 : THE TEACHER-TRAINING MODEL

4.1 INTRODUCTION

In Chapter 3 it was pointed out that, as far as Environmental Education is concerned, two sets of processes can be identified in teacher-training. The first set relates to the training that students must undergo in order to be Environmentally Literate, while the second relates to the training that they must receive in order to be effective in Environmental Education. The former set of processes is called "learning-and-responding", while the latter is referred to as "teacher-training".

Having dealt with the learning-and-responding part of teacher-training in Chapter 3, attention now may be turned to the complete training programme.

4.2 GUIDING PRINCIPLES FROM THE LITERATURE AT LARGE

A search through the literature reveals a number of guiding principles for teacher-training. Twenty of these seem to recur more frequently than others, and consequently are used as a basis for discussion on teacher-training programmes.

4.2.1 The watchword for all teacher-training must be relevancy. The education that trainee teachers receive must be relevant, not only to themsleves, but also to the teaching situations in which they will find themselves (e.g. Shane, 1968:21; Smart, 1979:109; Commonwealth Secretariat, 1974:7-8).

4.2.2 Human relations principles must be discussed and understood by the trainee teacher. Education should emphasise social interaction and responsibility. We live in the most interdependent co-operative society the world has ever known. Trainee teachers need to know how to teach responsibly in this world. (e.g. Reavis and Whittacre, 1974:80; Jooste, 1974:104; Combes, 1981:372).

4.2.3 Trainee teachers should be aware of the social, cultural and political environment in which they will be working. (e.g. Olson, 1974:69; Smart, 1979:115)

4.2.4 Teachers should be familiar with the contents of subjects they are to teach. Emphasis should be placed on processes rather than on structures. Most important is that teachers are encouraged to see the way in which the contents of various subjects dovetail together to develop "wholes" (e.g. Stapp, 1977:37).

4.2.5 There should be de-emphasis on information as an end in itself. Teachers should be trained to understand both the information as well as the personal meaning of the information (e.g. Blume, 1974:139; Katz, 1978:57).

4.2.6 Teachers should be able to identify realistic aims and objectives for all learning situations, and to be able to state these coherently (e.g. Marsden, 1976:22-46).

4.2.7 Teachers should be trained in the techniques of effective communication (e.g. Borke and Burstyn, 1974:163-166).

4.2.8 A knowledge of learning theory is fundamental to good teaching (e.g. Haberman and Stinnett, 1973:80-81).

4.2.9 Teachers should be made familiar with a wide range of teaching methods. Emphasis should be placed on innovative teaching, with the teacher developing his own teaching methods where circumstances demand it (e.g. Reynolds, 1978:25-29).

4.2.10 Teachers should be trained in problem-solving. They should be able to analyse problem situations, and to decide on strategies towards their solution (e.g. Brown and Reece, 1978:51; Katz, 1978:59; de Bono, 1976:180).

4.2.11 Teachers should be trained in values clarification. The values that people have affect their beliefs and actions. By studying the processes of values clarification, teachers learn how to encourage positive environmental values in their pupils. (Hanselman, 1979:3-80; Stapp et al, 1980:8).

4.2.12 Teacher trainers must see themselves in the role of facilitators rather than teachers or lecturers. (e.g. Hug, 1981:pers.comm.; de Bono, 1976:180).

4.2.13 Teachers should be trained to deal with change. Our society, our whole world, is changing constantly. Continuous change requires continuous learning if there is to be adaptation to it. If there is no education for change, or if discussion on specific types of change is mishandled in the didactic situation, then the change could cause trauma in young people. Teachers should be trained to deal with change in the didactic situation, both at a general as well as at a specific level. This would increase the abilities of their pupils to adapt, and reduce the risk of trauma. (Jooste, 1974:104; Biesheuvel, 1977:3-7).

4.2.14 Flexibility of teacher-training is important. College curricula must not be too institutionalised. (Husen, 1979:23).

4.2.15 Teacher education must be inter-disciplinary, especially with regard to problem setting and problem-solving. (e.g. Commonwealth Secretariat, 1974:35; Katz, 1978:60).

4.2.16 Teachers should be trained in evaluation. They should be able to evaluate critically not only their own teaching, but also the programmes of which they are part. They must be trained to become part of an on-going process of evaluation and improvement in their local educational milieu (e.g. Cropley and Dave, 1978:48-49).

4.2.17 Teachers should have a basic understanding of the differences between children. They should study the effects of different environments on learning behaviours (e.g. Reavis and Whittacre, 1974:80).

4.2.18 Teachers should be trained in the use and/or management of teaching-learning resources. This refers to resources such as outdoor sites (in the school grounds and beyond), printed materials (such as library books and charts,) and audio-visual materials (such as slides and tapes.) It also includes "people resources" such as peers, parents and shopkeepers. This training should include basic aspects of educational technology such as closed circuit television and micro-teaching. (e.g. Educational Technology Reviews Series, 1973:6).

4.2.19 Teachers should be encouraged to be "self-actualising". Teacher-training must develop self-confidence and increase motivation (e.g. Jooste, 1974:106; Reavis and Whittacre, 1974:79).

4.2.20 Teacher-training must not stop once the teacher has completed his degree/diploma. The need for continuous learning is one of the vital aspects of a teachers life (e.g. Noble, 1972:1; Jooste, 1974:106).

In third world situations distance from learning centres may mean that further training by correspondence is necessary. This is stressed by Husen (1979:34).

4.3 GUIDING PRINCIPLES FROM THE TRANSVAAL EDUCATION DEPARTMENT

In 1979 the Transvaal Education Department (TED) produced a report based on a mission to overseas countries (in North America and Europe). Part Two, Volume Two of this report discusses a training model for primary school teachers from an aims perspective (TED, 1979). This (verbal) model

provides broad guidelines for teacher-training, and eight basic principles which should be incorporated into any teacher-training programme are listed. These are quoted as follows (op.cit., 12-13):

> 1. The basic training should have a duration of at least four years and should have a strong integrated character. Within this integrated course, considerable emphasis must be placed on, in addition to sufficient attention to the academic foundation, the professional aspects of the training.
>
> 2. The pre-service and in-service training must be globally planned to form a unity and so (sic) that the principle of continuous training is applicable to all teachers.
>
> 3. Academic contents, which must be irreproachable in standard, must be selected in such a way that they can be described as "teacher-directed contents".
>
> 4. Sufficient academic subjects of a suitable standard must be included in the basic training, so that teachers can convent (sic) the four year Higher Education Diploma to a degree by means of one year of further study.
>
> 5. The professional aspect of the training must be strengthened to the extent that the professional status of the primary school teacher is entirely above suspicion. By involving the schools more closely in practical training and offering a form of internship, a contribution can be made to a higher degree of "professionalisation"

6. The acquisition of knowledge of basic research procedures (independent thinking, critical evaluation of information leading to insight and understanding after precise observation) must form an integral part of academic contents and practical teaching experience, and contribute significantly to the final promotion of students.

7. Attempts must constantly be made to raise the quality of candidates for teaching, especially by selecting students who possess the potential characteristics which can be developed by the further "professionalisation" of the training.

8. Lecturers responsible for the training of teachers must constantly by (sic) encourage, in addition to distinguished academic qualifications in their various subject areas, also to provide themselves with sound backgrounds in Education.

4.4 THE TEACHER-TRAINING MODEL

4.4.1 The need for a comprehensive synoptic model

Numerous overseas writers have discussed models for teacher-training (e.g. Brown and Reece, 1978; DeNevi, 1974; McPhie, 1974; Reynolds, 1978 and Romine, 1974).

Although there are numerous works on particular aspects of teacher-training in South Africa (e.g. Jooste, 1974; Boyce, 1976; Greese, 1977; Gluckman, 1980). there does not appear to be a South African college with a model for teacher-training which covers the total programme.

Writing on the aims and objectives for teacher-training, van der Merwe stresses the importance of comprehensive models and calls for a workshop involving all South African colleges to develop a comprehensive model as a matter of urgency (van der Merwe, 1981;355).

Synoptic models of teacher-training are particularly useful. They may serve as summaries of discussion of verbal models, and are also useful in showing the global character of complete programmes.

In this section a synoptic model for teacher-training based on the guiding principles contained in sections 4.1.1 and 4.1.2 is proposed. Although the model does not provide specific details of the training programme, it attempts to provide a comprehensive picture of all the processes involved.

Discussion on the comprehensive teacher-training programme may be divided into FIVE components. These are:

* The pre-training component.
* Relationships between the community and the training programme.
* The training programme itself.
* Constraints to effective training.
* Continuous in-service improvement.

It is not within the scope of this study to discuss these five components fully. Only those details which are germane to this study are dealt with in any depth.

4.4.2 The pre-training component of the teacher-training model

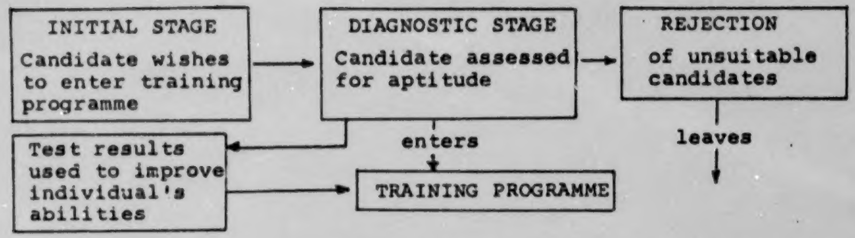

INITIAL STAGE
Candidate wishes to enter training programme
DIAGNOSTIC STAGE
Candidate assessed for aptitude
REJECTION
of unsuitable candidates
Test results used to improve individual's abilities
enters
TRAINING PROGRAMME
leaves

FIGURE 13 : THE TEACHER-TRAINING MODEL: THE PRE-TRAINING COMPONENT

It is a generally held view that teachers are "born and not made". Most researchers in the field of teacher-training are of the opinion that intending teachers should be carefully screened before they are accepted for training (e.g. Brown and Reece, 1978:51-52; Dickson, 1979;1-8; TED, 1979;13).

There should be a diagnostic test measuring the aptitude of intending teachers. This test should be administered before the student enters the programme, and unsuitable candidates should not be allowed to proceed with training.

In Dickson's view (1979;18) another value may be attached to the use of a diagnostic test before a programme of training commences. The college has a record of each students pre-training score, which may be used in identifying weaknesses and strengths in each student. Weaknesses can then be worked on and strengths capitalised on during the period of training.

4.4.3 Relationships between the community and the training programme

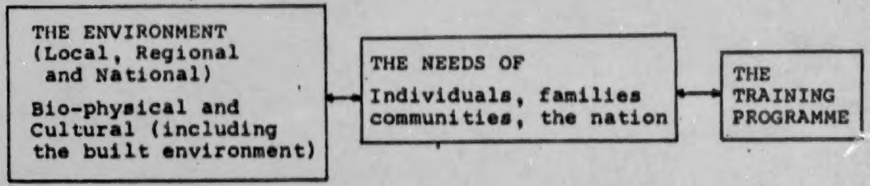

THE ENVIRONMENT
(Local, Regional and National)
Bio-physical and Cultural (including the built environment)
THE NEEDS OF
Individuals, families communities, the nation
THE TRAINING PROGRAMME

FIGURE 14 : THE TEACHER-TRAINING MODEL: THE COMMUNITY ENVIRONMENT

Most writers (e.g. Smith, 1968:53; Shane, 1968:21; Smart, 1979:109; TED, 1979:13).agree that teachers must be trained for work in the "real" world. This means that they must be aware of the needs of individuals, families and communities in the areas in which they are to teach. The training programme should encourage them to consider these needs and should equip them to teach effectively with these needs in mind.

The recently published report on teacher education by the Human Sciences Research Council,(HSRC, 1981 (c),Report No. 13:6) makes a strong plea for education systems that are based on the needs of local communities. The report says inter alia that:

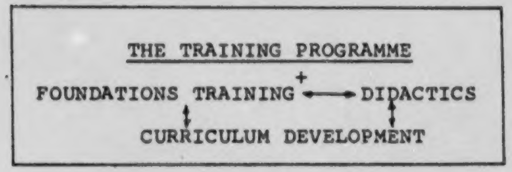
> ŉ Skoolstelsel wat nie voorsiening maak (vir die gemeentskapsbehoeftes) staan los van die gemeenskap in wie se diens dit staan en verbreek die kontinuiteit tussen gesin en gemeenskap - ŉ verbreeking wat uitloop op frustrasie en ontredderde indiwidue wat nêrens ŉ plek in die samelewing kan volstaan nie.

The needs of individuals, families and communities are influenced by the community environment. This environment has both bio-physical as well as cultural elements. The impact of the bio-physical environment (including the built environment) on the community must be taken into account when teacher-training programmes are being designed. This is particularly relevant when the quality of life of people is considered vis-a-vis the broader framework of Environmental Education.

The training of teachers in relation to the needs of the community must be appreciated. On-going evaluation in the light of the changing needs of the community should be a continuous process in the teacher-training programme..

Since there is an interrelationship between the community and the training programme, it follows that some of the course work done by the student teachers should provide information and skills on the community and its environment. This course work is discussed in the sections that follow.

4.4.4 The training programme itself



+ : Includes learning-and-responding programme

FIGURE 15 : THE TRAINING PROGRAMME ITSELF

The training programme is concerned with the development of basic knowledge and skills required for teaching, and with encouraging positive attitudes towards both the material to be taught and the didactic situation.

The TED report on teacher-training (1979:13), discussed in detail in section 4.3, stresses both the acquisition of "academic" knowledge as well as knowledge of "basic research procedures". It also emphasises that teacher-training programmes should aim at developing a high standard of professionalism in student teachers. This professionalism is related to academic qualifications, teaching ability and attitude to teaching.

van der Merwe, (1981:250) discusses teacher-training in terms of a triadical structure. The three parts of the triad are:

* Knowledge - what the teacher must know in order to qualify as an expert teacher. .

- Performance - what the teacher must be able to do to show expertise as a teacher.

- Attitudes - the attitudes that the teacher must display in order to reveal himself as a good educator.

The first part of van der Merwe's triad reflects the opinion that teachers must be well informed about the contents of the subjects they teach. They should know also what skills the pupils need in order to study effectively. The second part relates to the methods used by the teacher. The teacher must know the aims and objectives of teaching and use the best methods to achieve them.

In the third part of the triad, attitudes are stressed. Van der Merwe considers that without the "correct" attitude to both the subject matter as well as to the pupils, the teacher would not qualify as a "good educator" (op.cit.:250).

The elements of van der Merwe's triad are included in the teacher-training model proposed in this study. However, following the example of Brown and Reece,(1978:51-52) it has been preferred to place them in three,different, categories. These are:

- Foundations Training

- Didactics (Methods) training. (Including teaching experiences.)

- Training for Curriculum Development.

These categories do not necessarily show progressional instruction, and some elements within each may run in parallel to others.

4.4.4.1 Foundations Training

(INCLUDES LEARNING-AND-RESPONDING PROGRAMME)					
LE	LC	CS	DS	EXA	EDA
FOUNDATIONS TRAINING					

LE = Local Environment
LC = Local Community
CS = Content Subjects
DS = Didactic Situations
EXA = Extra-mural Activities
EDA = Educational Administration

FIGURE 16 : FOUNDATIONS TRAINING

Much of this training consists of developing knowledge, concepts and understandings of specific material to be taught, the provision of experiences in those subjects and the provision of a supply of knowledge and skills from which the student can draw in order to teach effectively.

During foundations training the student teacher is encouraged to develop sound attitudes towards, and values about, the four basic elements of the learning situation, namely knowledge, skills, attitudes and values, as well as towards the learners themselves.

The processes of foundations training may be categorised in different ways. Some of the processes belong in more than one category. All are interrelated within the training programme. For convenience of discussion SIX categories have been selected. These are processes related to:

- information, skills, attitudes and values relating to the local environment.
- information, skills, attitudes and values relating to the local community.
- the acquisition of knowledge of, and skills associated with, the "content"subjects such as Mathematics, History and English.
- information, skills, attitudes and values relevant to the didactic situation.
- extra-mural activities including clubs, sports and physical education.
- educational administration.

From the above it may be seen that during foundations training student teachers should receive training in the affective domain as well as in the cognitive domain.

It is beyond the scope of this study to suggest all the courses or parts of courses which should be part of foundations training. Courses such as those in the History of Education, School Administration, First Aid and Physical Education would be typical of the foundations training programme.

As can be seen from Figure 16 the environmentally oriented learning-and-responding processes are an integral part of foundations training. As these were discussed in detail in Chapter 3 they will not be discussed here. In the light of this study the processes identified in this section are considered of prime importance in foundations training. Other topics which were not discussed in that section and which are directly relevant to Environmental Education include Educational Psychology, Sociology, and the Philosophy of Education.

In section 4.4.3 the point was made that student teachers need to be aware of the needs and aspirations of the community in which they may be teaching. They should be trained to be sensitive to these needs and aspirations. To achieve this purpose the training programme should have courses in such subjects as Applied Sociology and Applied Psychology. Practical involvement in the local community would be the best way of reinforcing college work and providing practice in adjusting to new situations. It is only by identifying with people in their own environment that teachers will be able to tackle environmental issues and problems.

4.4.4.2 Didactics Training

While the student teacher is acquiring knowledge and skills and developing sound attitudes and values through the foundations programme, he will need to acquire knowledge and skills relating to teaching methods. (There is, in fact considerable overlap between foundations training and didactics.)

Didactics training is NOT just training for the classroom situation only, but is training for the learning situation wherever it may take place.

It is not within the scope of this study to suggest the type of training that student teachers should receive in didactics for the various subjects. This study concentrates specifically on the didactics of Environmental Education.

In sections 2.4.5 to 2.4.11 the guiding principles for effective Environmental Education at schools were discussed. These principles may be used to suggest some of the topics which should be integral to Environmental Education didactics courses:[+]

- Student teachers need to receive training in inter-disciplinary and multi-disciplinary studies. In this way they will be encouraged to adopt an holistic approach to environmental teaching.

- Student teachers need to be trained in the management of fieldwork and/or practical work, so that they themselves can conduct successful fieldwork exercises.

  This training would include training in the development and testing of teaching and/or learning aids

- Local fieldwork is essential for student teachers, so that they can obtain experience in teaching in the local environment.

[+] These topics do not necessarily entail separate courses in the general programme. They may form part of one or more courses within the general programme.

- Student teachers should be trained in dealing with problem-solving situations, particularly in environmental issues. (This includes training for values clarification.) Problem-solving experiences in the learning-and-responding programme, should equip them for training in this field.

- Student teachers should be trained in setting realistic aims and objectives for their teaching projects or programmes.

  During discussion on problem-solving in section 3.4 it was pointed out that all didactic situations, even problem-solving exercises, should be guided by carefully considered goals. It was pointed out also that without goals (decided upon by the teacher) educational experiences, whatever their nature, run the risk of losing their value.

- In order to be effective in problem-solving, student teachers need to be trained in the management of the learning milieu. This would include training in the management of group discussions and questioning techniques.

- Student teachers should be trained in dealing with values clarification. Values rest at the base of all human behaviour. Since teachers seek to change behaviour (positively) they need to understand the mechanism of this process in order to make the best use of it.

- Teaching experience (teaching practice) is part of the methods training programme. The student should have ample scope to apply the theoretical knowledge gained during Foundations training, and to experiment with teaching techniques of his own.

There should be at least one compulsory lesson or set of lessons per year on Environmental Education.

4.4.4.3 Training for curriculum development

In a previous study Hurry, (1980:83-97) criticised the way in which school syllabuses are compiled.

Syllabuses are usually drawn up by committees and are seldom if ever tested in schools before being implemented. In addition there is also little follow up assessment of the suitability of materials, either through discussion with teachers or through pupil testing.

Hurry also criticised the fact that there appears to be no attempt by planners to correlate material between school subjects. The curriculum is fragmented as a result. He stressed the fact that this lack of co-ordination leads to gaps in the pupil's knowledge and understandings of their surroundings.

Practising teachers should be innovators in the field of education. They must understand the processes involved in the development of currucula in schools, and should have the necessary knowledge and insights, firstly to criticise them constructively and secondly to suggest improvements.

Curriculum development could be handled in the 3rd or 4th years of instruction, by which time the students should be familiar with the work being done at schools.

Instruction in curriculum development could be done in stages. For example:

Stage 1: **Theoretical considerations**

The students discuss curriculum development in South Africa. This would include discussion on the role of subject committees and the ways in which syllabuses are developed and implemented.

Stage 2: **Teaching experience**

During teaching experience the students make a study of a selected curriculum. The syllabuses in the curriculum are analysed with particular reference to congruence between the content of the syllabuses and their aims and objectives.

Stage 3: **Curriculum revision**

The students would make suggestions on improvements and alterations to the syllabuses. This could be done in consultation with teachers at practice schools.

4.4.5 The training of self-actualising teachers

The certificated teacher is the end-product of the teacher-training programme. The knowledge, skills, attitudes and teaching abilities of the teacher are a direct measure of the success of the programme.

However the programme should do more than equip teachers to teach. It should equip them also to continue to grow as teachers.

Every teacher-training programme should do something to enhance the development of self. This relates to the development of self-understanding, self-confidence and self-control (Habermann and Stinnett, 1973:84). It also relates to self-actualisation (Blume, 1974:137-144). Self-actualisation means that teachers must come to feel involved in education and part of its growth and development. They must be motivated to develop sound educational programmes without necessarily waiting for outside stimulus.

This discussion relates to that on the locus of control in Section 2.4.10. In that discussion the point was made that if the individual feels that he is able to contribute to the solution of problems (i.e. where the locus of control is internal) then the motivation exists for further study of problems and involvement in strategies towards their solution.

4.4.6 Constant in-service improvement potential

It has already been stressed that teacher-training programmes should be developed with the needs and aspirations of local communities in mind. Student teachers should be trained to be sensitive to these needs and aspirations.

A number of writers (e.g. Olson, 1974:69; Husen, 1979:34; TED, 1979:12) have stressed the need for teachers to be in touch constantly with the "outside world" once they are in service. At least four important reasons are given:

- Teachers need to keep in touch with the social milieu in which they teach.
- Teachers need to keep up to date with trends in education in general.
- Teachers need to keep up to date with the content of their syllabuses.
- Teachers need to keep up to date with new developments in teaching methods.

The improvement can be self-actualising in that teachers actively seek information; it can be regulated, in that teachers are obliged to attend in-service courses; and it can be (indeed many people would say "should be") a mixture of both in which teachers encourage agencies such as teaching centres or museums, to run programmes for them.

4.4.7 Constraints to effective teacher-training

A number of writers have identified constraints to effective teacher-training (e.g. LeBaron and Klatt, 1971:35; Noble, 1972:13).

Five major constraints seem to affect most training programmes:

4.4.7.1 Certification requirements

The local education authority (in the case of the Transvaal, the Transvaal Education Department) stipulates certain prerequisites. Some of these may inhibit the training of teachers in certain cases. (For example the requirement of Afrikaans as a second language would affect the train- of an immigrant teacher who cannot speak Afrikaans.)

4.4.7.2 Local and State personnel policies

Local and State authorities have policies relating to employment. These may affect the way in which teachers are selected for training. (For example in the Transvaal, lecturers at Training Colleges are Whites, non-Whites being excluded from employment as teachers in the TED.)

Local and State policies also affect the employment of college personnel. For example it is not possible to employ a person who is not in possession of a suitable teaching diploma or degree at teachers' colleges. This automatically eliminates someone with expert knowledge in other areas (e.g. ecology, forestry), but who does not have a teaching certification.

4.4.7.3 Problems with school administrative staff

Co-operation with school personnel is important if the student teachers are to have meaningful in-training teaching experience.

There are frequently problems between student teachers and school staff. These problems may not necessarily relate to a lack of willingness on behalf of the school staff, but rather to misunderstandings as to their role in the training process.

Problems of this kind diminish the value of the in-training teaching experience.

4.4.7.4 The image of the teaching profession

The teaching profession, at best highly conservative, fears radical departures from present practices. In one respect, a profession is, by definition, an inhibitor of change. People who are in the profession tend to adhere to the same norms and standards of conduct. They will tend to keep out those who do not. The "ins" will continue to keep out the "outs" until they come to look like the "ins".

Although this form of professionalism is often an unconscious phenemenon, it may constitute a direct threat to the growth and development of teacher-training programmes.

4.4.7.5 The unsuitablilty of some intending teachers

Not all candidates for teacher-training are suitable for the job. In some instances students consider entering the profession because admission requirements and course standards seem less demanding than in other forms of tertiary education.

4.4.8 Lubricators

For every constraint to the teacher-training programme there is a solution (or solutions). In this study these are referred to as "lubricators".

4.4.8.1 Certification

Constraints relating to certification may be overcome if the requirements of the various courses were more flexible. It may be possible to examine each application on its merits and to allow students to waive certain courses in certain cases.

4.4.8.2 Local and state personnel policies

When local or state policies are drawn up the focus of attention should be the production of effective, self-actualising teachers. If it is necessary to employ someone who does not have a suitable teaching certificate, this should be possible. For example the employment of a good environmental interpretor (with training in disciplines such as forestry or nature conservation) may be necessary to improve standards of environmental interpretation at college.

4.4.8.3 Problems with school personnel

Relationships with school administrations and with school teachers in general could be immeasureably improved if representatives of the schools could be brought into the development of the teacher-training programme. By identifying with the training programme, serving teachers would feel involved with it and would be in a better position to assist with it.

4.4.8.4 The image of the teaching profession

One of the ways of overcoming conservatism in the teaching profession is to encourage innovative behaviour amongst student teachers. Student teachers should be encouraged to be flexible in their approach both to teaching and to the communities they serve. If teachers develop autonomy as a result of the training programme, they will be less inclined to follow the norm for its own sake, and more inclined toward innovation in their teaching approach.

4.4.8.5 The unsuitability of intending teachers

An ideal programme contains diagnostic procedures for overcoming the constraint of unsuitability of candidate teachers. If the diagnostic procedure is applied during training, as well as before training, the chances of an unsuitable candidate entering teaching will be reduced.

4.4.9 The comprehensive synoptic model

In the introduction to this section it was stated that synoptic models of teacher-training are preferred to verbal models, since they give insights into, and allow for global discussion on, the total programmes.

Figure 17 shows a comprehensive synoptic model which summarises the discussion in the preceding sections. Note that it contains the five components discussed in section 4.4.1.

4.5 KEY ELEMENTS IN THE TEACHER-TRAINING MODEL

The model in Figure 17 deals with teacher-training in general. Although all the elements in the model are relevant in some way to effective Environmental Education, only TEN have been selected as being of greatest relevance in this study.

These ten elements have been selected in the light of the discussion on the guiding principles of Environmental Education, discussed in detail in sections 2.4.5. to 2.4.11.

These ten key elements, together with the key elements identified for the learning-and-responding model, (Section 3.5), are used in assessing current teacher-training programmes with regard to Environmental Education.

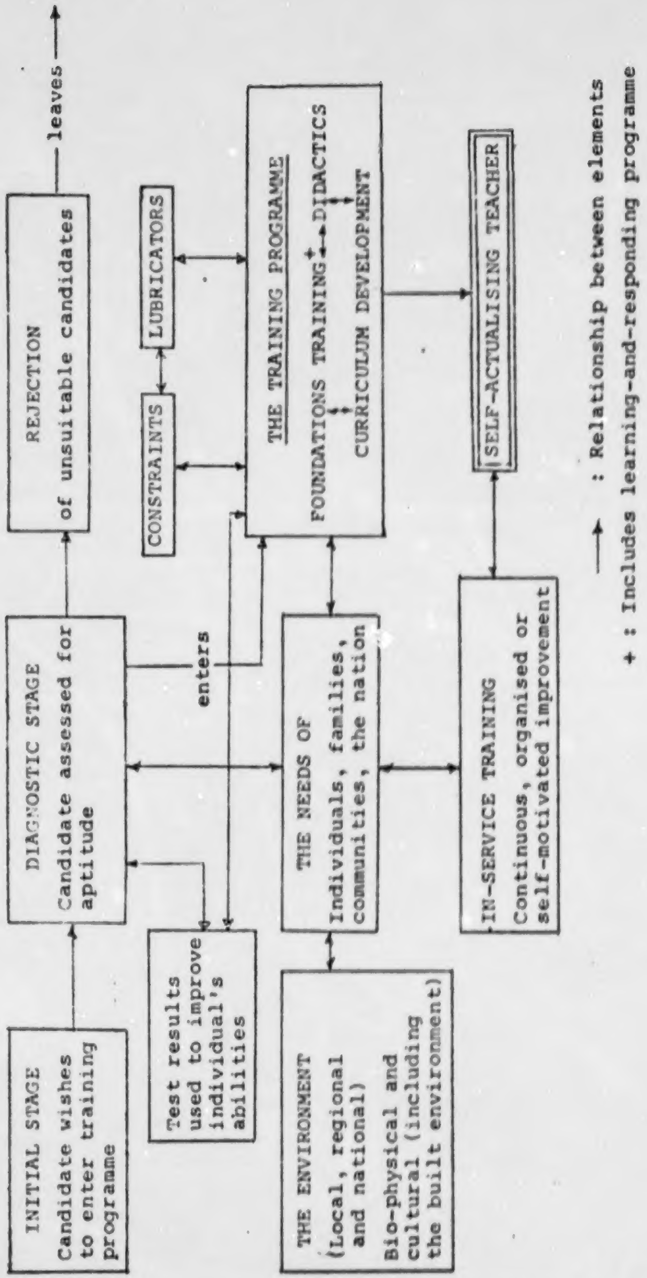

INITIAL STAGE
Candidate wishes to enter training programme
DIAGNOSTIC STAGE
Candidate assessed for aptitude
REJECTION
of unsuitable candidates
leaves
Test results used to improve individual's abilities
enters
CONSTRAINTS
LUBRICATORS
THE TRAINING PROGRAMME
FOUNDATIONS
TRAINING+
DIDACTICS
CURRICULUM DEVELOPMENT
THE ENVIRONMENT
(Local, regional and national)
Bio-physical and cultural (including the built environment)
THE NEEDS OF
Individuals, families, communities, the nation
IN-SERVICE TRAINING
Continuous, organised or self-motivated improvement
SELF-ACTUALISING TEACHER
→ : Relationship between elements
+ : Includes learning-and-responding programme

FIGURE 17 : A COMPREHENSIVE MODEL FOR TEACHER-TRAINING

The ten key elements relate to:-

1. Training with regard to holistic subject teaching, including training with regard to integrated studies (theme teaching).

2. Training in the planning and management of field-work and/or practical work, particularly with regard to the local environment, which includes the development and testing of materials.

3. Training in the management of the learning milieu, with special reference to:

    motivation

    discussions

    intra-group processes

4. Training in the setting of objectives and, most important, in achieving these objectives. (This relates to modifications of attitudes and behaviour in the pupils being taught.)

5. Training with regard to values education.

6. Training with regard to problem/conflict solving. (Across the board, at any level, including the handling of controversial issues.)

7. Teaching experience specifically related to Environmental Education.

8. The training programme developed against the background of the needs and aspirations of the community in which the teacher will be teaching.

9. The familiarisation of student teachers with curriculum design and adaptation.

10. The continuous evaluation of the programme and updating it when necessdry in terms of the needs of the community at large.

4.6 CHAPTER SUMMARY

4.6.1 Researchers in different parts of the world have stressed the role of the teacher in ensuring the effectiveness of Environmental Education programmes.

Teacher-training is identified as the first priority in education.

4.6.2 There are basically two sets of processes for teacher-training in Environmental Education. These are:

- The learning-and-responding process in which Environmental Literacy is developed in student teachers.

- The teacher-training process in which the teachers are shown how to teach Environmental Education effectively.

In Chapter 3 a model for learning-and-responding was discussed. In this chapter a teacher-training model is developed.

4.6.3 Twenty guiding principles for teacher-training are identified. Using these guiding principles a synoptic model for teacher-training is proposed.

The teacher-training model has five components. These are: the pre-training component; relationships between the community and the programme; the training programme itself; constraints to effective training and continuous in-service improvement.

4.6.4 The training programme itself has three components. These are foundations training; didactic training and curriculum development.

4.6.5 The goal of teacher-training is described as the development of self-actualising teachers.

4.6.6 Various constraints to teacher-training are discussed. The solutions to these constraints are described as "lubricators".

4.6.7 In the teacher-training model ten key elements are identified. These will be used, together with the key elements of the learning-and-responding model to assess the training programme at selected Transvaal colleges.

CHAPTER FIVE

TEACHER-TRAINING AND ENVIRONMENTAL EDUCATION

3 : THE BASES OF THE B. PRIM. ED. PROGRAMMES

> "For Environmental Education to fully recognise its potential, it must be grasped by all elements of society. This means in formal education that Environmental Education must become an integral part of each curriculum. It must penetrate to the very assumptions upon which education is based."

Dean Bennett 1976
Trend paper, Belgrade Workshop
on Environmental Education.

CHAPTER FIVE

TEACHER-TRAINING AND ENVIRONMENTAL EDUCATION

3 : THE BASES OF THE B. PRIM. ED. PROGRAMMES

5.1 INTRODUCTION

Chapters 3 and 4 dealt with Environmental Education and teacher-training. Two models for training programmes were discussed. These models are applicable to the training of both primary and secondary school teachers.

In this study attention is focussed on primary school teacher-training, and the models are used to assess the status of Environmental Education in primary-school teacher-training in the Transvaal, with special reference to the B. Prim. Ed. programme.

The primary school training programme has been selected because there are no subject choices in primary school education, and most primary school subjects are taught by one teacher. There is thus potential in the primary school for the teacher to deal with Environmental Education effectively, using all school subjects as vehicles in developing Environmental Literacy. In addition education is compulsory in the Transvaal up to the age of 16 years, and by concentrating attention on improvements to primary school teaching, one is also concentrating attention on improving Environmental Education in schools with the greatest cost-benefit.

This chapter deals with the bases for the training programmes, while the following chapter deals with the B. Prim. Ed. programmes themselves.

5.2 CONTROL OF TEACHER-TRAINING AMONGST WHITES

According to the National Education Policy Act of 1967 and the Teachers' Training Act of 1968, the Minister of National Education (hereinafter referred to as the Minister) controls the training of White teachers in the Republic of South Africa.

Sections 8 of the Teachers' Training Act of 1968 states that the Minister, after consultation with the controlling body of the institution, shall determine:

* The type of training which may be provided at any institute;
* The type of teacher for whose training provision may be made at any institute;
* The requirements with which prospective students shall comply; and
* The conditions subject to which bursaries or loans may be awarded to students.

5.3 THE COMMITTEE OF EDUCATIONAL HEADS

The National Education Policy Act of 1967 established the Committee of Educational Heads (COEH), whose function it is to advise the Minister on school education and teacher-training. This Committee consists of, inter alia, the Secretary for National Education, the Directors of Education of the four provinces and the Secretary of the Joint Matriculation Board.

In an attempt to maintain high standards in education the COEH has compiled "The criteria for the evaluation of South African qualifications for employment in education." (Hereinafter referred to as "the Criteria"). "The Criteria" provide the minimum qualifications for teachers intending to work in State schools. From time to time they are up-dated by the COEH. The last up-date was in 1978.

5.4 CRITERIA FOR THE EVALUATION OF SOUTH AFRICAN QUALIFICATIONS FOR EMPLOYMENT IN EDUCATION.

As the control of teacher-training rests with the Minister, colleges in South Africa are obliged to use "the Criteria" as the basis for all their teacher-training programmes. According to the latest (1978) edition of "the Criteria", the minimum academic and professional qualifications for the B. Prim. Ed. programmes are quoted as follows:

* The admission requirements and choice of subject must comply with the requirements for a degree approved for teaching purposes: Provided that at least one course in each of the official languages has been taken ..... and provided further that at least one first-year course in one of the following subjects has been included:

  Mathematics, History, Geography, Biblical Studies, a Bantu Language, Physical Science OR Physics OR Chemistry, Biology OR Biological Science OR Zoology OR Botany, and Natural Science OR Physics OR Chemistry.

- Education (Pedagogics), including the following five subdivisions of the disciplines and taken at least up to second-year degree level:

  History of Education, Philosophy of Education, Psychology of Education, Didactics, Sociology of Education.

  (School guidance and Counselling and Organisation and Administration of Education must be included.)

- Methods

  For the senior primary school, method of teaching at least three primary school subjects:

  OR

  for the junior primary school, method of teaching beginners.

  Method of School Guidance and Counselling may be taken in addition to any of the above, provided that Psychology 111 or Guidance and Counselling Psychology 111 or Education 111 (which may not overlap paragraph 11.5.2.2) has been included in the degree course.

- Religious instruction/Biblical Studies

- Teaching aids

- Training in at least one of the following practical subjects for the senior primary course, or at least two of the subjects for the junior primary course:

  Physical education, Art, Class Music, Handwork (Men/Women).

- Ten weeks practice teaching is a minimum requirement.

- Language endorsement (Which relates to the degree of proficiency shown by the teacher in both official languages.)

5.5 MODELS OF TEACHER-TRAINING IN SOUTH AFRICA

It appears than none of the colleges has theoretical models of teacher-training which could be adapted to satisfy "the Criteria". Most colleges seem to use "the Criteria" as a model and to build their training programmes around them. (This finding is corroborated by van der Merwe, (1981:335) who makes an urgent appeal for the development of teacher-training models.)

The implication of this is that the colleges do not appear to have an holistic picture of the complete training programme for their students, and that they appear to be subject-orientated rather than student-orientated as a result.

5.6 THE SIGNIFICANCE OF "THE CRITERIA" FOR THE B. PRIM. ED. PROGRAMMES

Although "the Criteria" stipulate the general subjects which students in the B.Prim. Ed. programme must take in order to qualify for employment in a provincial education department, they do not stipulate the contents of these courses. There is scope thus for teachers' colleges to develop programmes which seek to satisfy their own aims and objectives.

In addition there is scope also for the different colleges to add courses to their programmes not prescribed by "the Criteria".

5.7 THE SIGNIFICANCE OF "THE CRITERIA" FOR ENVIRONMENTAL EDUCATION.

"The Criteria" stipulate a number of compulsory courses which the student teacher must take in order to qualify for employment in education. They list also a number of optional courses which the student may take.

The way in which the various colleges group the subjects together will affect the choices that the student may make at any one college; this in turn will affect Environmental Education. In addition the contents of the courses and the approach to them will also affect Environmental Education.

5.8 DO "THE CRITERIA" ALLOW FOR EFFECTIVE ENVIRONMENTAL EDUCATION IN THE B. PRIM. ED. PROGRAMMES? AN ASSESSMENT IN THE LIGHT OF SELECTED KEY ELEMENTS.

In Chapter 3 and 4 two models for teacher-training were developed. The first (Figure 12) related to the development of Environmental Literacy in student teachers and the second (Figure 17) showed a comprehensive model for the complete training process.

Two sets of key elements were identified, one for each of the two models. (See Section 3.5 and 4.8) In this section these sets are used in assessing the potential of "the Criteria" for effective Environmental Education in the B. Prim. Ed. programmes.

5.8.1 "The Criteria" and the key elements from the learning-and-responding model.

5.8.1.1 Environmental Literacy as a basic aim of the programme.

"The Criteria" do not list any aims or objectives for teacher-training. However these can be inferred from the list of compulsory subjects, (priority subjects) since one presumes that their inclusion is to satisfy the unexpressed aims of the COEH.

"The Criteria" list a number of subjects which are compulsory in the first year. Since the list includes most environmental subjects (such as Geography, Biology and History) one must conclude that environmental knowledge is an aim of "the Criteria".

It is of significance that Religious Instruction is listed apart from other areas of study. The inference of this is that "Religious Literacy" is very much an aim of "the Criteria".

5.8.1.2 The appointment of an Environmental Education Co-ordinator (Eeco-teacher).

"The Criteria" are not concerned with the teaching staff at colleges. There is nothing therefore to prevent the appointment of an Environmental Education Co-ordinator. (Eeco-teacher)

Should a college decide to create a new post, (as opposed to an existing one such as Biology being used) then permission would first have to be obtained from the Administrator of the Province in which the college lies.

5.8.1.3 Exposure to holistic teaching

Although there is a wide choice of content subjects from which the student may choose, "the Criteria" do stipulate at least one course from the following subjects:

- Mathematics, History, Geography, Biblical Studies, a Bantu language, Physical Science OR Physics OR Chemistry, Biology OR Biological Science OR Zoology OR Botany, and Natural Science OR Physics OR Chemistry.

Theoretically, there is ample scope for subjects, particularly environmental subjects, to be taught holistically.

However, despite the fact that these courses are compulsory for at least one year of study, there is a danger of students not receiving an holistic education. The problem still may exist that programmes are not holistically designed and that as a result the courses within them together do not provide a complete picture.

For example the first year course in Biology at JCE does not deal with soil studies. This topic also is not dealt with by the first year course in Geography. First year students lack information on soils and therefore do not acquire an holistic picture of the bio-physical environment.

Tinley, (1974:3) has pointed out a similar problem with B.Sc. courses at many universities. He shows that, although students study elements in the environment during subjects such as Botany and Zoology, they frequently do not understand ecological principles fully because of omissions in individual courses. According to Tinley these omissions are caused by a lack of communication between departments at the planning stage. This study has revealed similar lack of communication between departments at the training colleges (a point which is elaborated on in section 6.4.3).

5.8.1.4 The provision of basic information on the total human environment.

"The Criteria" allow for a wide range of choices as far as "content" subjects are concerned. The compulsory subjects make allowances for a wide cross-section of environmental information.

Provided that the courses have been developed holistically, there is potential for satisfying this key element.

5.8.1.5 Training for fieldwork and/or practical work

Although fieldwork is not stipulated in "the Criteria" there is scope for this type of experience in various "content" courses (for example History, Geography, Zoology, Botany and Biology).

(Note: Fieldwork includes any type of extra-college study, ranging from botanical studies in the college grounds to studies in a museum or art gallery. General training for fieldwork should equip the student to work in the field effectively regardless of what he is studying.)

5.8.1.6 Values education.

There is scope for this type of education in the compulsory section on basic education, particularly as school guidance and counselling are compulsory elements of this section.

5.8.1.7 Training for problem-solving.

The note on values education applies also to problem-solving.

5.8.1.8 Involvement with local issues as an exercise in problem-solving.

Note 5.8.1.5 - fieldwork and/or practical work - applies equally well to this section.

5.8.2 "The Criteria" and key elements from the teacher-training model.

"The Criteria" are not prescriptive to the point that they stifle the initiative of individual colleges with regard to the didactics training of their student teachers.

Nevertheless "the Criteria" do stipulate certain training courses and to this extent they have an influence on Environmental Education didactics at the colleges. It is necessary therefore in this study to make an assessment of their potential influence on Environmental Education didactics, and to comment on this assessment.

The ten key elements for effective teacher-training in Environmental Education, discussed in section 4.2, are used as the basis for this assessment.

5.8.2.1 Training with regard to holistic teaching

At the theoretical level there is scope for this type of training in Philosophy of Education (a compulsory course). Holistic teaching may also be taught through subject didactics (also compulsory).

There is scope for training in holistic teaching in the compulsory Methodology section particularly with regard to practice teaching. However it is noted that in the B.Prim. Ed. programme for Senior Primary (the focus of attention for this study) provision is made for the method of teaching three primary school subjects. This implies that there is emphasis on a subject orientated approach, and there could be a risk that holistic education is neglected.

5.8.2.2 Training in the planning and management of fieldwork and/or practical work, and the development and testing of teaching materials

Although "the Criteria" do not make the management of fieldwork and/or practical work compulsory, there is ample scope for this type of training in the compulsory Methods courses. By including fieldwork in certain of its Methods courses a college could thereby make it compulsory for all students.

(Note: It must be stressed that training for fieldwork and/or practical work does not imply work relating to Natural History or Geography only. This type of training is just as important with regard to cultural activities and visits, such as visits to historical sites, museums or art galleries.)

5.8.2.3 Training in the management of the learning milieu

Training of this type is catered for and could be included in either the compulsory Education section or the compulsory Methods section.

5.8.2.4 Training in the setting of realistic aims and objectives

This could be dealt with either in the compulsory section on Methods or during the compulsory ten weeks Teaching Practice.

5.8.2.5 Training in values education

Presuming that the student teachers themselves have been exposed to exercises in values clarification, they could be trained to deal with values clarification with the pupils they teach. This could be done in the compulsory Methods section, or during Teaching Practice.

5.8.2.6 Training in problem-solving

The note on Section 5.8.2.5 (values Education) applies also to this section.

5.8.2.7 Teaching experience (Teaching practice)

It is possible that one of several school subjects could be used as a vehicle for Environmental Education. However, unless this is stipulated, it is unlikely that many students will have experience in Environmental Education teaching.

5.8.2.8 Consideration for the needs and aspirations of the community.

There is scope for this in the compulsory section on the Sociology of Education. It would also be possible to deal with different aspects of this topic in both the Philosophy of Education as well as in the Psychology of Education.

5.8.2.9 Curriculum design and implementation.

There does not appear to be a ready "berth" for this key element. Courses that it could be included in are Administration of Education, Didactics or Philosophy of Education.

5.8.2.10 Programme evaluation.

One would not expect to find evaluation of college programmes in "the Criteria". However, if evaluation of school curricula is included in one of the Education courses then the students could be encouraged to evaluate their own college programmes, using the information and critical skills they have learned in that context.

5.9 DO "THE CRITERIA" ALLOW FOR EFFECTIVE ENVIRONMENTAL EDUCATION?

The answer to this question must be "Yes". "The Criteria" are sufficiently flexible to allow colleges to introduce all the key elements discussed above.

With regard to the learning-and-responding part of the training programme, the fact that all the environmentally orientated subjects are compulsory for at least one year is significant. It is obviously intended that all students acquire a minimum amount of environmental knowledge and/or skills. There is also scope for holistic teaching in student programmes, while other elements such as values education, fieldwork and problem-solving could readily be accommodated.

There is potential for the training of Environmentally Literate teachers in the compulsory sections of the teacher-training programme. Education, Subject Methods and Teaching Practice are some of the courses/experiences which could be used as vehicles in the pursuit of this goal.

5.10 CHAPTER SUMMARY

The Committee of Educational Heads (COEH) advises the minister of National Education on matters pertaining to teacher-training.

The COEH has drawn up a list of criteria for the qualifications of teachers seeking employment in education ("the Criteria").

As "The Criteria" have a direct effect on the compilation of teacher-training programmes they are discussed in detail in this chapter.

The 18 key elements for effective Environmental Education are used to assess the potential influence "The Criteria" could have on Environmental Education in colleges.

The conclusion is reached that "the Criteria" are sufficiently flexible to allow for effective Environmental Education in teacher-training.

CHAPTER SIX

TEACHER-TRAINING AND ENVIRONMENTAL EDUCATION

4 : AN ASSESSMENT OF THE B. PRIM ED. PROGRAMMES

> "Primary school education is a synthesis of understanding and compassionate partnership in which children and teacher explore the physical, intellectual, social, spiritual, moral and aesthetic experiences which go to make up the exciting and expanding world of the primary school child..."
>
> Tom Seymour 1977
> What is good teaching in the primary school?

CHAPTER SIX

TEACHER-TRAINING AND ENVIRONMENTAL EDUCATION

4 : THE ASSESSMENT OF THE B. PRIM ED. PROGRAMMES

6.1 INTRODUCTION

In Chapter 5 the potential of "the Criteria" for effective Environmental Education was discussed in terms of the eighteen key elements for training Environmentally Literate teachers identified in Chapters 3 and 4. The conclusion was drawn that "the Criteria" are sufficiently flexible to allow for the inclusion of most key elements in the B. Prim. Ed. programme.

In this chapter the B. Prim. Ed. programmes of four Transvaal Colleges of Education are examined in terms of the key elements mentioned above and the question is asked: "Is Environmental Literacy (as defined in Section 2.4.4 of this study) one of the aims of primary school teacher-training in the Transvaal?"

The assessment of the four college programmes is based on:

- A study of college syllabuses.
- Personal interviews with members of college staffs, including the principals of the four colleges.
- A research questionnaire which was sent to selected lecturers at the various colleges, and the subsequent discussion this evoked.[+]

[+] A copy of the questionnaire and a discussion on its compilation is to be found in Appendix C.

6.2 THE SELECTED B. PRIM. ED. PROGRAMMES

The four colleges of education selected for this study are:

1. Onderwyskollege Pretoria (OP) (linked with the University of Pretoria).
2. Pretoria College of Education (PCE) (linked with the University of South Africa).
3. Onderwyskollege Goudstad (OG) (linked with the Randse Afrikaanse Universiteit).
4. The Johannesburg College of Education (JCE) (linked with the University of the Witwatersrand).

6.3 BACKGROUND CONSIDERATIONS

The curriculum for the degree of B. Prim. Ed. extends over at least four years of academic study.

A number of Transvaal universities offer the B. Prim. Ed. programme. Although they are responsible for the curriculum as well as for the final examinations, the universities do not always supply the venue of the lecturing staff. In some instances the lecturing is done by the college lecturers at the colleges of education, while in others the lecturing is done by university staff at the universities. In this study, as a matter of convenience, the programmes are referred to as college programmes rather than university programmes.

It is acknowledged that the B. Prim. Ed. programmes have not been in existence for long, and that much developmental work has still to be done. This could be seen as a problem as far as this study is concerned, since many ideas still in the "melting pot" could benefit Environmental Education in the short or in the long term. On the other hand the programmes are ideally placed to incorporate as many new ideas as possible.

In making critical comments of existing B. Prim. Ed.programmes it is the intention of this work to stimulate new thoughts and actions rather than to criticise those in their infancy.

Some subjects are compulsory at the colleges, others not. In this study the contention is that all teachers should be Environmentally Literate, and for this reason only compulsory subjects or activities are discussed.

The three most important compulsory environmental subjects offered by colleges are Biology, Geography and History. Since the fundamental aim of Environmental Education is the conservation of the Earth life-support systems, Biology and Geography are given more emphasis in this study. Notwithstanding this, History is an integral part of Environmental Education since it provides important information on the socio-cultural environment.

6.4 ASSESSMENT OF THE COLLEGE PROGRAMMES USING EIGHT KEY ELEMENTS FROM THE LEARNING-AND-RESPONDING MODEL.

6.4.1 Environmental Literacy as a basic aim of the programme

All four B. Prim. Ed. programmes are in their formative stages. No college has stated (written) aims and objectives for the training programme as a whole or for the individual subjects.

However it is possible to infer the degree of commitment to Environmental Education of the degree programmes, by examining other factors. These include the nature of the stated goals for diploma programmes, the presence or absence of compulsory environmental courses in the curriculum, and the attitude of college lecturing staff.

6.4.1.1 Written aims and objectives for complete training programmes

It is possible to infer long term goals for the B. Prim. Ed. programme, by referring to similar goals in diploma programmes.

It is noteworthy that only JCE has stated aims and objectives for complete training programmes in the teaching diplomas it offers. (Johannesburg College of Education, 1978:1-3).

In its aims and objectives for diploma courses for Senior Primary, Junior Primary and Pre-Primary education, JCE places its objectives in three categories, namely objectives concerned with the intellectual development of the student, objectives concerned with the acquisition of professional skills by the student and objectives concerned with the personal development of the student.

An examination of the JCE objectives reveals that although there is no direct reference to Environmental Literacy, there are a number of objectives which are relevant to it.

For this reason, and for the sake of discussion to follow, each of these is quoted in extenso as follows:-

1. Objectives Concerned with the Intellectual Development of the Student.

1.1 The student will demonstrate a mastery of knowledge gained through major subjects and independent study.

Command of knowledge will be demonstrated by the ability to use knowledge to solve problems, to understand, to explain and even to create new knowledge.

1.4 The student will be able to apply the knowledge gained about the child and society to the practical teaching situation. This knowledge is to come from academic studies, personal observations, studies in child psychology and from classroom experience.

1.7 Students will recognise the significance of their knowledge in the contexts of education, society, culture and the world at large.

(These objectives should be achieved through the study of the academic majors and specialisations, Educational studies, the languages, independent study and teaching experience.)

2. Objectives Concerned with the Acquisition of Professional Skills by the Student.

2.1 Arising out of the study of education as a discipline, and from other subjects studied, the student will evolve a set of personal values and attitudes towards teaching and children to which he is committed and in terms of which he functions professionally.

2.4 The student will be able to justify the choice of objectives, methods, content and evaluative procedures in terms of his/her philosophy of education and current education practice.

2.5 The student will demonstrate an understanding of the dynamics of the classroom situation by being able to motivate the pupils, to provide harmonious working relationships and to provide the conditions necessary which would contribute to the welfare of the child.

These objectives imply that students should have the theoretical knowledge of a skill as well as the ability to perform the skill practically. (These objectives will be achieved through: subject methodology, educational studies, intensive practice, knowledge of organisational and disciplinary techniques, an understanding of systems and their functions.)

3. Objectives Concerned with the Personal Development of the Students.

3.5 The students will become more sensitive to the needs and status of others.

3.7 The students will develop values which are consistent with their personal integrity and the demands of the teaching profession.

(These objectives will be achieved through: the college milieu, interpersonal relationships, cultural and extra-mural activities, independent study, service to society, positions of leadership.)

Examination of these general aims and objectives leads one to the conclusion that JCE has aims and objectives for diploma courses which are indirectly related to Environmental Education. For example:

* Aim 1.1 clearly reflects an interest in autonomous learning. In the model of teacher-training (figure 17) the ultimate goal of teacher-training is given as the self-actualising teacher.

- Aims 1.4 and 1.7 reflect a concern for the community and the community environment. In section 4.4.3 the importance of the community-teacher-training programme was emphasised.
- Aim 2.1 reflects a concern for values and attitudes. In the learning-and-responding model (figure 12) the importance of values education in teacher-training was stressed.
- Aim 2.4 shows an appreciation of the importance of setting realistic aims and objectives in teaching. In the teacher-training model the point was made that teachers should have goals for all their teaching activities, including activities such as fieldwork and problem-solving.

It may be presumed that when JCE writes aims and objectives for it's B. Prim. Ed. programme, they will be of a similar nature to those discussed above.

All college principals expressed the opinion that Environmental Literacy is a basic goal of their total programmes. They referred the researcher to work being done in departments such as Biology and Geography in this respect. More specific information in this connection was obtained through the research questionnaire and personal communications.

6.4.1.2 The use of courses in college programmes as indicators of programme aims and objectives.

It has been stated that only one college (JCE) has written aims and objectives for each of it's diploma programmes and

that none has these aims and objectives for the B. Prim. Ed. programmes.

Despite the absence of general aims and objectives it is possible to gauge the level of commitment of colleges to Environmental Education by an examination of courses, (both types of courses as well as their contents), and through discussion with college staff.

An important element of Environmental Literacy is environmental knowledge. (See section 2.4.4) The level of commitment of colleges to Environmental Literacy as a goal of their programmes can be gauged by the presence or absence of compulsory courses providing this knowledge.

a) Provision for courses in Geography and Biology

To begin with, what of the environmentally orientated subjects such as Geography and Biology? "The Criteria" for the evaluation of South African qualifications for employment in education" (known in this study as "the Criteria") state that at least one course in each of the three environmental subjects (Geography, Biology and History) should be taken in the B. Prim. Ed. programme. This may be interpreted as either a "content" course or a "methods" course. Two of the four colleges have interpreted it the former way (PCE and JCE), and two the latter (OP and OG). At OG, Geography, Biology and History are compulsory only at the didactic level, while at OP, Biology is the only compulsory subject of the three at "content" level.

This evidence leads one to the conclusion that Environmental Education (as defined in this study) is not a basic aim of all four college programmes. It would appear that only PCE and JCE have the provision of environmental information concerning the total human environment, while OP considers biological information most important and OG does not provide environmental information in separate "content" courses.

b) Other curricula evidence of a commitment to Environmental Education.

What further evidence is there in the curricula which could reveal the degree of commitment to Environmental Education of the four programmes?
Table 1. summarises the contents of compulsory environmental courses at JCE, PCE and OP while Table 2. summarises the contents of the methods courses of environmental subjects at OP and OG.

From Table 1. it is apparent that the students should be in a position to obtain a wide range of environmental information at these three colleges. There is thus a clear commitment at these colleges to this aspect of Environmental Literacy.

This commitment is reflected in the answers given by Geography and Biology lecturers at the three colleges in responding to the research questionnaire. Without exception they stated that Environmental Literacy was an aim of their particular courses. (For example Scott, (JCE), Thomas, (OP), Potgieter, (PCE). Biology lecturers, in particular, emphasise environmental information during studies on ecology.

TABLE 1

COURSE CONTENTS: FIRST YEAR (COMPULSORY ENVIRONMENTAL SUBJECTS AT JCE AND PCE AND COMPULSORY BIOLOGY COURSE AT OP.

(FW* = Fieldwork a compulsory part of the course)

SOURCES: University of the Witwatersrand, 1982
Universiteit van Pretoria, 1982
Pretoria College of Education, 1981

	BIOLOGY	GEOGRAPHY	HISTORY
JCE	Introductory module Basic concepts Cytology Physiology Ecology 1 Trachyophyta Angiosperms Vertebrates Invertebrates FW*	The Earth as a planet Astronomical Geography Mapwork Geomorphology Population Geography Human settlements FW*	Development of Western civilisation
	NATURAL SCIENCE	GEOGRAPHY	HISTORY
PCE	Physical & chemical basis of life Cytology Taxonomy Histology Study of morphology of selected life forms (e.g. fungi, protozoa, bacteria) Study of morphology of plants Ecology FW*	Nature of Geography Role of the Geography teacher Mapwork Statistics Human settlements Human occupations Regional studies Transport and communications FW*	History of Western Civilisation
	BIOLOGY		
OP	Introductory module Cytology Taxonomy Representative plants and animals Life processes Theory of evolution Ecology FW*		

TABLE 2

COURSE CONTENTS OF COMPULSORY COURSES IN SUBJECT DIDACTICS : ENVIRONMENTAL SUBJECTS AT OP AND OG.

(FW* = Fieldwork compulsory)

SOURCES: Randse Afrikaanse Universiteit, 1982
Universiteit van Pretoria, 1982.

	NATURAL SCIENCE	GEOGRAPHY	HISTORY
OG	Systematic classification of plants and animals Plant and animal cytology Integration of textbook and library resources Teaching methods and evaluation The Science lesson Laboratory work Museum practicals Study of school syllabuses	Geography in historical perspective Aims of Geography teaching Study and evaluation of school syllabuses The Geography lesson Schemes of work and planning Integration with school library Evaluation	Historical perspectives Aims of History teaching Study and evaluation of school syllabuses The History lesson Schemes of work Evaluation Integration with school library

	GEOGRAPHY	HISTORY
OP	Study and evaluation of school syllabuses The value of Geography in the school curriculum ** Teaching of geography Schemes of work Subject policy The Geography lesson The Geography classroom Newspaper Geography Fieldwork Evaluation	The nature of History Teaching History in the primary school The structure of the Histpry lesson Teaching essential details Project work and class organisation Evaluation Study Themes

** Includes discussions on environmental studies and nature conservation.

- AT OP

An examination of the compulsory "content" courses at OP reveals that ecological information is available to the students (through Biology), but that geographical and historical information is not. However, from Table 2 it may be seen that environmental issues at OP are stressed during the Geography didactics course. Topics such as "environmental studies" and "nature conservation" (interestingly not "environmental conservation") are discussed as elements in school Geography. These elements thus reflect a measure of commitment at the teaching level, but since no in-depth studies of the environment are made, there is no commitment to the provision of basic Geographical information. In the case of History no commitment to Environmental Education is stated or inferred.

- AT OG

At OG where all three environmental subjects are compulsory only with regard to didactics, there is little emphasis on the provision of environmental information. During Biology didactics the students learn about plant and animal classification systems, plant and animal cytology, and plant and animal morphology. There is no mention of ecology in this course. The Geography Course is mainly related to didactics, with no mention of environmental information.

It may be said therefore that the provision of environmental information, a basic element in Environmental Education, is not the aim of all four colleges of education.

c) Presence/absence of training in the affective domain as an indicator of Environmental Education aims and objectives.

Having considered the provision of environmental information in syllabuses as an indication of Environmental Education, what of the other requirements? Environmental Literacy is not concerned only with environmental knowledge. It is also concerned with positive environmental values and attitudes and behaviour that is congruent with these (i.e. affective educational objectives).

In a previous study Hurry, (1978) found that many educationists viewed Environmental Literacy (or an equivalent term for the same concept) as mainly a question of environmental knowledge. In particular, respondents laid an emphasis on "Nature Conservation" (as opposed to "Environmental Conservation") when Environmental Literacy was discussed. In this study this misconception was in evidence in at least one college lecturer who suggested, in his reply to the questionnaire, that a knowledge of ecology was sufficient training for Environmental Literacy. This attitude leads to an over-emphasis of nature conservation and an under-emphasis of the many issues in environmental conservation.

Other evidence on implied Environmental Education aims and objectives relates to student training in the affective domain. It was established in section 2.4.3. of Chapter Two that

learning activities in the affective domain were integral to effective Environmental Education. Although there is evidence from "content" courses in Biology and Geography that lecturers stress the information and skills aspects of environmental studies (i.e. the cognitive domain), there is little evidence of involvement of lecturers with the devel-development of attitudes, values and patterns of behaviour (i.e. the affective domain).

All respondents to the questionnaire agreed that objectives in the affective domain are important. Biology lecturers attempt to develop in their students positive attitudes towards the organisms they study and towards environmental conservation in general. Nature Conservation is an integral part of most first year courses. (Scott, pers. comm. Thomas, pers. comm.) Geography lecturers also emphasise man's responsibilities in the environment. (Pienaar, pers. comm.; Fairhurst, pers. comm.)

However, discussions with lecturers in Biology and Geography reveal that work done in the affective domain remains at a theoretical level. Issues such as environmental pollution, soil erosion and urban sprawl are usually discussed during lecture periods. There is also a tendency to discuss national or international problems rather than local or regional ones.

Values education is also integral to effective Environmental Education (section 2.4.11). Values clarification is not dealt with at all by any department of Biology or Geography (in the first, compulsory course). Most respondents had not thought of using this teaching approach during their classes, and most agreed that values clarification would be valuable in developing positive attitudes to environmental conservation. There was one dissenting respondent who preferred to see values education remain entirely with the Department of Education. (Values education is in fact dealt with by most departments of Education, but research has shown that it is discussed briefly and not within the context of environmental issues.)

Problem-solving in the local area (the environmental encounter) is also integral to Environmental Education (sections 2.4.9 and 3.4.3.4). Only JCE involves its first year students in field investigations of environmental issues. (Pohorilly, pers. comm.) Most respondents agreed that activities which involved their students in these issues would be desirable, but saw time constraints to these exercises (e.g. Schoeman, pers. comm.).

In summing up, the evidence shows that while one element of Environmental Literacy, namely environmental information, is well attended to, other elements such as environmental attitudes and values and problem-solving are neglected. This leads one to the conclusion that, while Environmental Literacy is a stated (verbalised) aim of Biology and Geography departments, not all departments are working towards its achievement.

6.4.2 The appointment of an Environmental Education Co-ordinator

In section 3.4.3.7 it was emphasised that an Environmental Education Co-ordinator (Eeco-teacher) is necessary at a college to ensure that the college achieves its goal of Environmental Literacy.

None of the four training colleges has an Eeco-teacher.

(For an example of a school with an Eeco-teacher see Appendix D.)

6.4.3 Holistic teaching and learning-and-responding

In section 6.4.1. it was stated that there appears to be little evidence of an holistic approach to the learning-and-responding parts of teacher-training.

Only one college, (JCE) has aims and objectives for the training programmes as a whole, (for its diploma courses only at this stage).

There appears to be little contact or co-ordination of efforts between the various teaching departments of the so-called "content" subjects History, Geography and Biology at this stage of training. The evidence that exists shows that most communication is between the departments of Geography and Biology, (for example at JCE and PCE), and then mainly with regard to combined fieldwork exercises. (Pohorilly, pers. comm.; Fairhurst, pers. comm.)

There is no evidence to suggest that the contents of syllabuses in one department at any of the years of study are influenced in any way by the contents of another. (For example the dynamics of ecosystems is usually the domain of the Biology department. Geology and soils is usually handled by the Geography department.)

Despite the above criticism of the learning-and-responding parts of teacher-training with regard to holistic teaching, there is evidence in a number of programmes of an holistic approach. For example:

- The Geography department at JCE bases its regional studies programmes in the diploma courses on an instructional model known as a "Geotrine" (see Figure 18). By stressing the interrelationships between the three systems, namely ecosystems, economic systems and cultural systems a clear concern for holistic teaching is shown.

  Pohorille (pers, comm.) states that there is a similar systems emphasis in the B. Prim. Ed studies at JCE.

- The students at OG take two courses known as Wetenskapleer A and Wetenskapleer B. The aims of both courses relate to improving the student's knowledge of their chosen fields of study, and to seeing the relationships between them and the real world. Wetenskapleer B also stresses "die saamhang van hoofvakke met ander vakke en vakke onderling; ..." (RAU, 1982:90).

- PCE and JCE have courses in "Co-ordinated methodology" in the first and second years of study. An important element in these courses is to discuss the school curriculum as a whole as well as the general structure of knowledge". Paine, (pers. comm.) is of the opinion that these courses do much to encourage future teachers to view curricula holistically.

6.4.4 Provision of basic information on the total human environment

At least one course in each of the environmental subjects such as Geography, History and Biology must be taken at all

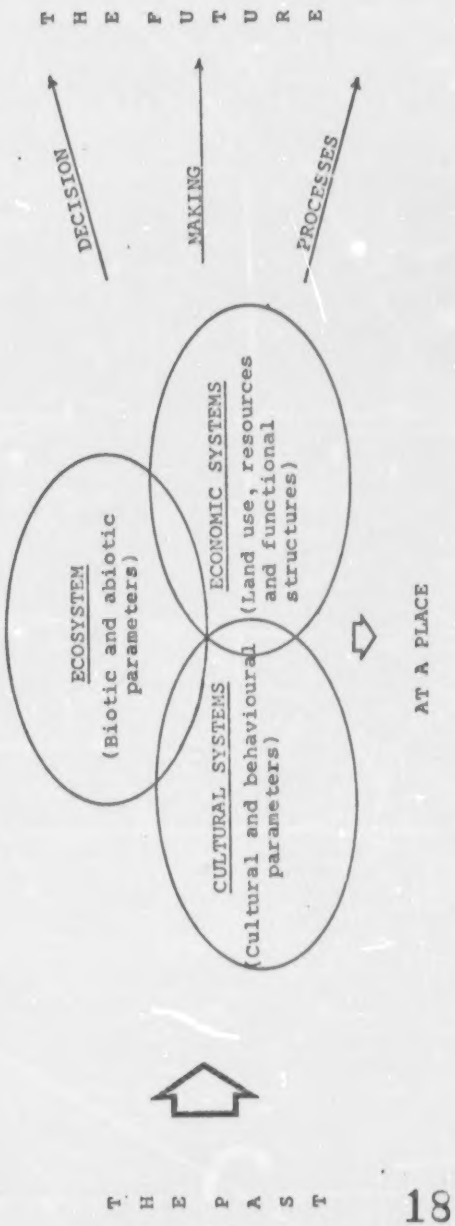

THE FUTURE
DECISION
MAKING
PROCESSES
ECOSYSTEM
(Biotic and abiotic parameters)
ECONOMIC SYSTEMS
(Land use, resources and functional structures)
CULTURAL SYSTEMS
(Cultural and behavioural parameters)
AT A PLACE
THE PAST

FIGURE 18 : THE GEOTRINE - A MODEL FOR HOLISTIC GEOGRAPHY TEACHING
(JCE, 1978:87)

four colleges. (This is in line with the requirements of "the Criteria".) However the manner in which they are approached and the contents of the courses are left to the discretion of the individual colleges.

Thus we have seen that at OP Geography and History are compulsory only in courses in subject didactics, while at OG all three are compulsory only in didactics (see Tables 1. and 2.) (An examination of the programmes show that Mathematics is compulsory at both OP and OG. This suggests that Mathematics is seen as basic to teacher-training whereas Geography, Biology and History are not.)

From Tables 1. and 2. it is clear that the students at JCE and PCE obtain information on a wide range of environmental topics. The students at OP receive information on biological topics, but may not receive training on geographical or historical elements. At OG none of the three environmental subjects is complusory at "content" level.

At JCE and PCE, where Geography, History and Biology (or Natural Science) are compulsory, it still may be asked whether the students receive sufficient information on the total human environment. To answer this question one must look more closely at the range of study areas and topics provided for:

- The Biology departments of these two colleges emphasise ecology in the first year of study.+ Geography departments provide information on the physical environment (e.g. climatology and geomorphology) and on man-environment relationships. Soil studies seem to be missing

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+ Interestingly only one department (the Geography Department at JCE) offers a course of ecology in a subsequent year of study.

from the first year of study. Geography courses do not deal with soils in the first year, and the topic is not dealt with in depth in the Biology courses.

- Biology students do not study mapping and the use of remote sensing in discussing the aerial distribution of phenomena. Spatial relationships, of great importance in ecology, are therefore not emphasised in this way. (This point is elaborated on in section 6.4.5, the discussion of fieldwork and/or practical work.)

- Since all the History courses deal with the development of Western civilisation, first year students will not receive information about their South African cultural heritage.

In summary it can be said that, with the exception of OG, first year programmes attempt to provide information on the bio-physical environment. However the programmes do not provide an holistic picture of the total human environment, as History and Geography are not always compulsory courses, and there are omissions both in content and in skills-training in Biology, Geography and History.

6.4.5 Training in the techniques of fieldwork and/or practical work.

Environmental fieldwork is usually associated with subjects such as Biology, Geography or History.

In section 3.4.2.3 it was emphasised that fieldwork should not just involve measurement and interpretation. It should also involve the learner in problem-solving situations.

As far as PCE and JCE are concerned fieldwork and practical work are compulsory in Biology (Natural Science) and Geography. Fieldwork and practical work are also compulsory in Biology at OP.

Fieldwork is not compulsory in any of the History courses.

Fieldwork is not an integral part of the Geography or Biology (Natural Science) didactics course at OG. Although theoretical consideration is paid to fieldwork at OP, practical considerations limit the amount of time spent on it (Schoeman, pers.comm.)

It would appear therefore that not all B. Prim. Ed. students receive compulsory training in fieldwork or practical work techniques.

Environmental problems are neglected during fieldwork experiences. This is discussed in more detail in Section 6.4.7.

It is significant to note that none of the four colleges of education (in fact none in South Africa) has developed outdoor education sites where college students can conduct fieldwork. (Weather stations on their own are not considered as well developed outdoor education sites.) This research has shown that where fieldwork is conducted within the college grounds, use is made of sites which have "evolved" co-incidentally with the college campus (shubberies, steps, pathways, etc.) It would appear that no formal planning has gone into the provision of outdoor education sites while the college campuses were being planned. This suggests that fieldwork within the college grounds is not considered, either at the planning stage or at a subsequent stage.

Comment must be made on the nature of practical work at both PCE and JCE. Whereas all Geography students do some practical work in mapping and the use of air photographs, Biology students do not. Biology students lack the experience in discussions relating to the areial distribution of phenomena. Since juxtapositioning is often significant with regard to ecosystem relationships, this is seen as an omission. (When one considers the value of such remote sensing devices as satellite images, for example the Earth Resources Technology Satellite (ERTS) images, in studying large areas of land, it is important that all Biology students be familiar with them.)

6.4.6 Values education and learning-and-responding

Values education was discussed in detail in sections 2.4.11 and 3.4.2.3. It is contended that in order to deal with values education in the didactic situation, student teachers themselves should have had extensive experience of values clarification.

Values education is a neglected field in teacher-training. Although all four colleges deal with "values", this is mainly in the context of moral development in young people within courses such as Philosophy and Education or Fundamental Pedagogics. The discussions are usually at a philosophical level, with little or no practical involvement by the students. Only one college (JCE) deals with the topic in another context, namely that of the value of the school curriculum. In this context the students discuss the school curriculum from a personal (value laden) point of view. (Lewin, pers. comm.).

It appears that no college deals with values clarification as a topic in its own right within a compulsory course. There is an apparent absence of values clarification as a practical activity with student teachers.

Values clarification in environmental issues is dealt with by one college only (JCE) but then only in a 3rd year (non-compulsory) course.

6.4.7 The development of problem-solving abilities

Problem-solving is a basic process in Environmental Education (see sections 2.4.9 and 3.4.2.3).

Most departments of Education, History, Biology and Geography state that problem-solving is a basic aim of their programmes.

Research indicates that in the compulsory courses offered by departments, (e.g. Biology at JCE and OP, Geography at PCE and JCE) the emphasis is mainly on the problem-solving approach to scientific investigations (e.g. Scott, pers. comm.; Kok, pers. comm.). It appears that no college offers a course or a section of a course in problem-solving as a technique in its own right. (See section 2.4.9).

Environmental problems are dealt with during compulsory courses in Geography and Biology. In general the issues are discussed at a theoretical level (e.g. air and water pollution) although there are exceptions (e.g. the first year Geography course at JCE which deals with problems of waste disposal and other urban issues during field excursions).

At OG where Geography and Biology are not compulsory at the "content" level, environmental issues are not studied during the didactics course.

6.4.8 Involvement in local issues as an exercise in problem-solving

As far as can be ascertained few departments involve their students in practical studies of local environmental issues/problems (in compulsory courses). The first year Geography course at JCE is an exception that has been already mentioned.

6.5 ASSESSMENT OF THE COLLEGE PROGRAMMES USING THE TEN KEY ELEMENTS FROM THE TEACHER-TRAINING MODEL

In Section 6.4 eight key elements from the learning-and-responding model were used to assess the contributions of the four training colleges to the development of Environmental Literacy in intending teachers. In this section ten key elements from the comprehensive teacher-training model are used to assess the four college programmes in terms of Environmental Education didactics training.

6.5.1 Training in holistic teaching

Two colleges, namely JCE and PCE have Co-ordinated Methodology as part of their Education courses. The aim of the course is to give the student teacher an holistic view of primary school education. Topics such as the teaching situation, the structure of knowledge, organisation of work, observation techniques and learning beyond the classroom are dealt with.

According to Lewin, (pers. comm.) and van der Linde, (pers. comm.) subject integration is dealt with during the Co-ordinated Methodology course at JCE and PCE respectively. Both multi-disciplinary and inter-disciplinary approaches are dealt with. However this work is dealt with at a theoretical level, with practical work being left to the discretion of the student (e.g. at a practice school).

OG deals with integrated studies during courses in Education, while OP deals with them during fundamental Pedagogics. As with JCE and PCE the topic is dealt with at a theoretical level, with practical work being left to the discretion of the student.

6.5.2 Training with regard to the management of fieldwork (including the preparation of worksheets)

Before commencing a discussion on the training of teachers in fieldwork methodology, it is worth commenting on certain aspects of teacher-training at two of the four colleges, namely OG and OP. Both colleges appear to have a pre-occupation with the "structure of the lesson" (die les-struktuur), which could have a marked effect on their students' attitudes towards fieldwork in the primary school, particularly fieldwork within the school grounds.

Both colleges use booklets with similar titles (Die lesstruktuur), which form the basis of teacher-training. An examination of both booklets leaves a strong impression that there is an over-emphasis on learning in a classroom situation (as opposed to a learning situation anywhere) in which the teacher digests a predetermined body of information and then conveys the material to the learner. The teacher becomes familiar with the content and then assumes the role of expert in conveying information to the learner. In the booklets of both colleges, interactions between learners or between learners and their environment are hardly mentioned. This gives one the impression that the approach at both OG and OP is geared to a classroom situation, and that outdoor education would not easily fit the model provided.

The following is a list of the chapter headings in the book used by OG, which seems to substantiate this view (Kookemoer et al, 1979: Inhoudsopgawe)

Chapter 1: Inleidende opmerkings oor die lesstruktuur
2: Die onderwysdoel
3: Lesfases
4: Onderrig en leerwyses
5: Die voltrekking van kategoriale vorming en die reduksie in leerinhoud.
6. Akualisiering en funksionalisering
7. Onderwys-en leermiddele in die leestruktuur
8. Leerinhoudordening en verbesondering.
9. Die lesstruktuur en sy komponente

It has been stated already that fieldwork experiences are not compulsory for all colleges (see section 6.4.5).

Outdoor education (learning beyond the classroom) is discussed during Co-ordinated Methodology courses at PCE and JCE, during Fundamental Pedagogics at OP and during Education at OG. Fieldwork management is not dealt with during any of these courses.

Fieldwork management is dealt with by some colleges during the first year Biology or Geography courses. (E.g. Biology at OP, Geography at PCE). (Interestingly, it is not taught as part of either Education or Pedagogics.) These first year courses are not compulsory at all colleges. In other instances this topic is dealt with during didactic courses. (E.g. Biology at JCE and PCE). Since there are choices of subjects which students may take with regard to didactics, this means that it is possible that some students may not receive any training in fieldwork management during didactics training. In addition not all departments of Geography or Biology offer fieldwork management as part of their didactics courses. (For example at OG neither department offers it.)

In section 6.4.5 it was pointed out that no college has a specially prepared outdoor education site where investigations could be conducted. There is thus no experience of this type of facility.

(As far as is known only one college in South Africa offers a course in fieldwork managament as a course in its own right. This is the Geography department at JCE which offers this course as an elective. It is usually taken in the third year of study.)

6.5.3 Training with regard to the learning milieu with special regard to motivation, group processes and group discussions.

This aspect of teacher-training is well attended to. All four colleges of education deal with motivation as an integral part of courses in either Education or Pedagogics.

Group discussions are seen by all four colleges as an integral part of the didactic situation and these are dealt with in both theoretical as well as practical ways by the colleges, usually in Education or Pedagogics.

Group work is used by certain departments (e.g. Biology) in practical and/or fieldwork situations. Departments of Biology, Geography and History do not deal with the techniques of group management in the learning situation.

Some respondents consider practical exercises in group discussions as examples of problem-solving (See also 6.4.7) (E.g. Lewin, pers. comm. van der Linde, pers. comm.) The students are given a question to discuss and are asked to reach a conclusion. The contention is that in this situation the students are using discussion as a problem-solving tool. However none of the respondents use groupwork as a method for discussing environmental problems (in compulsory courses).

6.5.4 Training in the setting of attainable educational aims and objectives.

In sections 2.3.4 and 2.3.5 an appeal was made for teachers to have clearly stated aims and objectives for all the work they do. Without these guidelines there is a danger that basic principles will be neglected and that the lesson may lose its sense of direction.

There appears to be general agreement at the colleges on the importance of establishing goals in teaching. There is an emphasis on both aims and objectives at all levels of teaching, from the general aim associated with a section of work, to the specific objectives associated with a particular lesson. There is emphasis also on aims in all three domains, namely cognitive, affective and psychomotor.

Only JCE encourages its students to consider general aims for sections of the work in their Schemes of Work. The rationale for this is that students are thereby encouraged to think more holistically about the work to be done while it is at the planning stage.

An examination of the aims and objectives for specific lessons reveals that most departments have a child-centred approach to education. For example at OP aims that are discussed for school Geography lessons include those for broadening knowledge, forming attitudes, acquiring skills and improving language usage (Jordaan and Alberts, 1982:26-27). In many cases these general aims for geography lessons are related to environmental matters such as water and soil conservation.

6.5.5 Training in values education

Values education is essential to Environmental Education (see section 2.4.11). Without this education it would be difficult to show individuals the effect of their attitudes and values on their behaviour, and to encourage positive changes.

In Section 6.4.6 it was stated that values education is a neglected field in the learning-and-responding situation. Values are dealt with theoretically and in limited context and there is no experience of values clarification. Values education is also neglected in the teacher-training situation. Student teachers are not taught how to deal with values education and in particular with values alarification. There is a gap between the theoretical awareness of factors affecting the development of values and attitudes, and the "real world" situation amongst school children.

In particular, values clarification is not dealt with during studies in Geography, History or Biology. Since all three subjects have areas of potential prejudice, discussions and practicals on values clarification within the context of each would be most valuable.

Most respondents agreed that student teachers need to know more about and to discuss the formation of attitudes in young people. They also agreed that values clarification is a valuable educational process. They considered that work in attitudes and values should be done during Education or Pedagogics courses.

Despite omissions in values education, student teachers are encouraged to include aims for attitude development in their lesson preparations. For example at OP the aim is given to "arouse an attitude of appreciation for the farmer's work, and to create a simple understanding for the independence of town and district". (Jordaan and Alberts, 1982:26). In encouraging their students to include aims of this kind, the colleges are showing recognition of the role of attitudes (and values) in influencing behaviour.

6.5.6 Training in teaching problem-solving techniques

It has been stated already (section 6.4.7) that students are involved with problem-solving relating to specific problems within courses, e.g. a problem relating to a scientific investigation. (Scott, pers. comm.). Environmental problems are studied superficially, with the emphasis being on the problem and not on the strategies towards its solution. For example: breaking the problem down into its components, deciding the factors affecting each component, and considering for which of the components the learner can suggest solutions.

With regard to teacher-training, (i.e. the way in which problems should be dealt with by teachers) the approach to problem-solving is dealt with in one of two ways:

- In the first case student teachers are involved with problem-solving relating to specific subject content, for example a problem in Mathematics, a research problem in Biology. They are shown methods and techniques that are applicable to the field of study, and how to teach young people these techniques.
- In the second case they are involved with problem situations during teaching. (Behavioural problems, learning problems, etc.). These are usually dealt with during Guidance (compulsory at three of the four colleges), or during Education or Pedagogics. (Kok, pers. comm.).

It would appear that no college has a compulsory course or section of a course which deals with problem-solving as a particular skill required by the teacher.[+] (Teachers are not taught how to deal with problems in general, or how to teach young people problem-solving techniques).

[+] JCE has an elective, usually taken in the 3rd or 4th year, in Environmental Education, which deals with approaches to environmental issues. (See Appendix F.)

6.5.7 Environmental Education and teaching experience

At all colleges students have extended periods of teaching experience. With the exception of OP (which starts its practice teaching in the second year) the periods of this experience begin in the first year and over the four years of training students have between 12 and 16 weeks of teaching experience.

The colleges expect their B. Prim. Ed. Students to obtain practice in teaching all primary school subjects, not just those in which they specialise. The rationale for this is that the students may find themselves teaching subjects other than those in which they have specialised, or may be teaching in schools where there is no specialisation.

At no college is Environmental Education a compulsory part of the teaching practice. However, students in Geography and Biology are encouraged to use suitable occasions to effect positive changes in attitudes to environmental issues (Scott, pers. comm.; Schoemann, pers. comm.).

6.5.8 Training with the needs and aspirations of the local community in mind

A discussion of the cultural milieu in which Transvaal (white) education is taking place is beyond the scope of this study. However it has been pointed out already (in section 2.2.3) that the cultural environment is an integral part of the total human environment, and therefore must be considered whenever Environmental Education is considered.

The key word in education should be relevancy. Whatever else education is, or whatever it tries to achieve, it must be relevant to the culture in which it is taking place.

Environmental Education is concerned with the total human environment (which includes the built environment) and the preservation of a quality of life which is acceptable to most people. Student teachers therefore should have some information on the built environment and the way in which it affects the quality of life. (Since the quality of life has a direct effect on the learning environment of the child, this type of study is doubly significant).

All colleges are concerned with providing information on the cultural environment and with discussing the inter-relationship between this environment and learning. Courses in the Sociology of Learning, (in Education or Pedagogics) appear to be the most commonly used vehicles for this discussion (e.g. Education 1B at OG and the first qualifying course in Education at JCE).

It appears therefore that students in the B. Prim. Ed. programmes are encouraged to think about the environment in which their pupils live and to appreciate the effects this may have on learning.

It has been stated that values education is neglected during teacher-training. Teachers are not trained to deal with values clarification with their pupils. This omission in their training could have serious effects of the teacher's ability to handle local issues.

6.5.9 The student teacher must be familiar with curriculum design

Discussions on school curricula take place during courses in Education or Pedagogics. The curriculum is discussed in terms of the physiological, psychological and sociological needs of the child (Lewin, pers. comm.).

However, it appears that no college deals with curriculum design or development in a practical way. I.e. No students are asked to design curricula at any stage, or to suggest changes to existing curricula. In this connection Fairhurst (pers. comm.) expressed the view that student teachers could not be expected to design curricula or to suggest changes to existing curricula, since they lacked "job experience".

It appears that no college deals with the system of syllabus development in South Africa, (e.g. The role of the national core syllabus committees, and the departmental core syllabus committees, for each school subject.)

Mechanisms for affecting changes to curricula (e,g, through the inspectorate, via the headmaster) are also not discussed.

6.5.10 The programme should be continuously evaluated and, if necessary, updated, in terms of the needs of the community at large.

A sub-title for this section could well be "Education for the real world". The comments contained in this section are relevant to all aspects of the teacher-training programme, and not just those affecting Environmental Education.

At all four colleges the overall evaluation of the B. Prim. Ed. programme is the responsibility of the Principal and a select committee. The committee meets from time to time to consider the programme as a whole.

Some individual programmes, such as the Biology programme at JCE are evaluated through regular meetings of staff members (Scott, pers. comm.). Others such as the Biology at PCE, are evaluated during an annual meeting (Potgieter, pers. comm.). It appears that the Education department at JCE is one of the few departments that evaluates its programmes through student questionnaires and discussions. (Lewin, pers. comm.).

Members of select committees use their experience in the local schools (usually during teaching practice) to determine the needs of the school communities, and thereby to adapt the training programme accordingly (e.g. Boyce, pers. comm., Paine, pers. comm.). As yet no attempt has been made to identify the needs and aspirations of the communities themselves (e.g. through interviews or questionnaires).

As far as possible the overall planning of the teacher-training programmes meets as wide a range of citizen needs as possible, particularly with regard to vocational guidance. (Viviers, pers. comm.). However,many respondents were doubtful whether environmental issues are well catered for in this respect, and considered that a concept such as "the quality of life" is difficult to bear in mind when planning training courses since it has different connotations for different communities (Paine, pers. comm.). Nevertheless a number of respondents agreed that the improvement of the quality of life is a neglected aim of teacher-training (e.g. Kok, pers. comm.; Vermeulen, pers. comm.)

6.6 IS ENVIRONMENTAL LITERACY ONE OF THE AIMS OF PRIMARY SCHOOL TEACHER-TRAINING IN THE TRANSVAAL ?

The answer to the question "Is Environmental Literacy one of the aims of teacher-training in the Transvaal?" must be a qualified "no".

The answer is "no" since there is no evidence of a stated aim for Environmental Education, and because none of the programmes fully satisfies the criteria for effective Environmental Education. In particular programmes do not provide students with sufficient (compulsory) environmental information, and there is a need for greater holistic teaching. Training in values education and problem-solving is neglected and there is little activity aimed at investigating environmental issues. Fieldwork is not a compulsory element of all training programmes. Finally there is evidence that some lecturers have a narrow view of Environmental Education. They see it as orientated to "Nature Conservation" rather than to "Environmental Conservation".

The answer is qualified since much is being done for Environmental Education in the colleges, despite an apparent lack of co-ordination. Most college lecturers are of the opinion that Environmental Education is important in teacher-training and believe their programmes to be in some way helpful in this regard. Departments of Geography and Biology are involved with certain aspects of Environmental Education, particularly at the "learning-and-responding" stage of teacher-training. Departments of Education or Pedagogics deal with many of the social and psychological issues related to Environmental Education, but fall short of some of the ideals, particulaly with regard to values clarification and problem solving.

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6.7 CHAPTER SUMMARY

6.7.1 In this chapter the key elements for effective Environmental Education in teacher-training (identified in Chapter 3 & 4) are used to assess B. Prim. Ed. Programmes at four Transvaal colleges. These are: Onderwyskollege Pretoria (OP), Johannesburg College of Education (JCE), Pretoria College of Education (PCE) and Onderwyskollege Goudstad (OG).

6.7.2 The conclusion is reached that, although much is being done by the colleges to train their students in Environmental Education, there are a number of problem areas. These are:

- No college has Environmental Literacy as an aim of teacher-training.
- The acquisition of environmental knowledge, or the development of environmental skills, is not compulsory for all students.
- Not all students receive experience in fieldwork, or are trained in the management of fieldwork. In some colleges there is an over-emphasis on teaching in a classroom situation.
- Values clarification, as a basic skill, is neglected. It is also neglected during didactics training.
- Problem-solving, as a basic skill, is neglected. It is also neglected during didactics training.
- Few colleges involve their students in problem-solving situations within the local environment. There is little or no training with regard to the management of such activities with school children.

- Curriculum development is dealt with superficially.
- The environmental needs and aspirations of people in the local community, particularly with regard to the quality of life, are neglected when teacher-training programmes are compiled.

CHAPTER SEVEN

SYNTHESIS AND RECOMMENDATIONS

> "To aspire to survival and to aspire to humanity are paths one and the same. All the logic, precision and practicality in the world can't save us if we lose our soul. There can be no survival without passion - passion for humanity, love of the earth, joy of existence and hope for the future."
>
> Stephanie Mills, 1976.
> As quoted by Agne and Nash in
> "The teacher educator as environmental activist".

CHAPTER SEVEN

SYNTHESIS AND RECOMMENDATIONS

7.1 SYNTHESIS

7.1.1 The background

Chapter One identifies the problem that many educationists are concerned about the status of Environmental Education in South Africa. Preliminary surveys (e.g. Irwin, 1982) indicate that the degree of environmental awareness in young people is directly proportional to the amount of Environmental Education they receive while at school. Observers have expressed the view that the first step towards teaching children to be aware of their environment is to train their teachers.

In the primary school, although the modern tendency is towards specialisation, it occurs frequently that teachers have to teach all school subjects. For this reason the writer maintains that all primary school teachers should be trained to teach Environmental Education. He consequently includes all these teachers in this study.

This study has two aims. The first is to examine Environmental Education in a world context, and the second is to determine the extent to which the Bachelor of Primary Education (B. Prim. Ed.) programmes at four Transvaal training institutions equip teachers to be effective in Environmental Education.

There are two secondary objectives of the study. The first is to provide a definition of Environmental Education as a frame of reference for this study, and the second is to make recommendations on possible improvements to the B. Prim. Ed. programmes with regard to Environmental Education.

7.1.2 The conceptual framework

Environmental Education in the world context was discussed in Chapter 2. In this chapter the point was made that the human environment is total in concept. The environment is everything that affects the life and growth of the individual and includes all the physical, biological and the cultural elements in his surroundings.

Environmental Education is a life-long process which leads to the acquisition of environmental knowledge and the development of attitudes, values and patterns of behaviour which reflect a concern for the health of the total environment as well as for the quality of life of all its inhabitants.

Environmental Literacy refers to a condition in which an individual has achieved the knowledge, attitudes, values and patterns of behaviour referred to above.

There is no specific target group for Environmental Education, although in this study attention is focussed on primary school student teachers.

Section 2.4.5 discusses guidelines for effective Environmental Education. These guidelines are to be used at all levels of education, both at school and at tertiary level.

In order to achieve the second aim of the study it has been necessary to develop models of Environmental Education for student teachers.

7.1.3 Models for effective Environmental Education for teachers

In designing models for effective Environmental Education for teachers two processes have been considered. In the first place there is a need to educate teachers environmentally, and to provide them with the knowledge, attitudes and skills which would lead to Environmental Literacy. In the second place there is a need to train teachers to be effective educators in Environmental Education. In this study the former training is referred to as "learning-and-responding", while the latter is referred to as "teacher-training".

The guiding principles of Environmental Education have been used to develop synoptic models for both sets of training processes. The learning-and-responding model is discussed in Chapter Three, while the teacher-training model is discussed in Chapter Four.

In section 3.5. eight key elements from the learning-and-responding model are listed. Ten key elements from the teacher-training model are listed in section 4.5. These eighteen key elements have been used in Chapters Five and Six to assess teacher education at four Transvaal training colleges.

7.1.4 Assessment of the B. Prim. Ed. programmes

The teacher-training programmes in the Transvaal are based on the "Criteria for the evaluation of South African qualifications for employment in education" referred to as "the Criteria".

The key elements in the synoptic models for teacher-training are used to assess the potential of "the Criteria" for effective Environmental Education. It was found that they are sufficiently flexible to allow colleges to develop good Environmental Education courses within their programmes.

The key elements were then used to assess the B. Prim. Ed. programmes of four universities/colleges of education. (In this study the term "college" is used to describe either the college or the university to which it is attached.) It was found that, while there is much in the programmes to contribute to Environmental Literacy, there are a number of areas of concern. These are listed in the summary of Chapter 6.

7.2 RECOMMENDATIONS

At the outset of this study it was stated that most researchers see improvements to primary school teacher-training as the most effective way of developing Environmental Literacy in school populations.

It was acknowledged also that the B. Prim Ed. programmes were chosen as examples because they are still in their infancy and should be amenable to change. All the recommendations in this study are made in the light of these remarks.

In making recommendations both "the Criteria" and the B. Prim. Ed. programmes themselves have been considered. This has been necessary in the light of the influence that "the Criteria" have on the development of the B. Prim. Ed. programmes.

(In section 5.8 of Chapter Five it was established that "the Criteria" are sufficiently flexible to allow Environmental Education to be integral to B. Prim. Ed. programmes. However a number of recommendations are made to improve the situation still further.)

7.2.1 Recommendations on aims and objectives for the programmes

7.2.1.1 Recommendations on aims and objectives for the complete programmes

In section 6.4.1 it is noted that no college has stated (written) aims and objectives for its B. Prim. Ed. programmes. It was suggested that without aims and objectives for the complete programme, it would be difficult to develop an holistic approach. Since holistic education is one of the guiding principles for Environmental Education (discussed in section 2.4.6):

- It is recommended that all colleges should have stated aims and objectives for their complete programmes.

The aims and objectives of JCE (discussed in section 6.4.1) are good examples of these. They are sufficiently broad to cover most areas of education, while at the same time they are sufficiently specific to give definite direction to the training effort.

- Furthermore it is recommended that Environmental Literacy should be a basic aim of all B. Prim. Ed. programmes.

In order to achieve this aim suitable objectives should be formulated. According to the classification of objectives at JCE (see section 6.4.1.1), this aim would fall into two categories. The first category relates to the intellectual development of the student, while the second relates to his personal development.

Using the JCE classification of objectives as examples the following objectives are suggested:

In the catagory relating to intellectual development the JCE objective 1.7 could be rewritten as follows:

1.7 Students will become aware of, and concerned about, the total human environment and its associated problems, and will have the knowledge, skills, attitudes, motivations and commitments to work individually and collectively towards solutions of current environmental problems and the prevention of new ones.

An additional objective relating to the personal development of the student might read:

3.8 The student will teach in a manner which is consistent with her concern for the well-being of the total human environment.

In addition to specifically stated Environmental Education objectives, care should be taken to include relevant aspects of Environmental Education in objectives of a more general nature.

For example it is possible to add to the JCE Aims and Objectives others which agree more specifically with the aims of Environmental Education:

Alter objective 2.2 as shown by the capital letters.

2.2 The student will demonstrate the ability to perform effectively in the TEACHING SITUATION (INSIDE OR OUTSIDE OF THE CLASSROOM) according to the criteria agreed upon by the college.

Alter objective 2.5 as shown by the capital letters.

2.5 The student will demonstrate an understanding of the dynamics of the LEARNING SITUATION by being able to motivate the pupils, to provide harmonious working relationships and to provide the conditions necessary which would contribute to the welfare of the child.

7.2.1.2 Recommendations on aims and objectives for specific programmes.

In this study it is contended that all disciplines at college should contribute in some way to the development of Environmental Literacy in student teachers.

With this in mind

- It is recommended that all college courses should have clearly stated aims and objectives, and that relevant aspects of Environmental Literacy should be included in them.

An example of an aim with an environmental orientation in a language course is "to develop in the student an ability to discuss issues logically and objectively". The same aim would also apply to a course in Educational Psychology. An objective for a course in Education might be that "the student teacher will be able to conduct a field excursion in the manner decided upon by the college, and will be able to accurately measure his pupils' progress as a result of the field excursion."

It has been said that many college lecturers are not familiar with Environmental Education. Lecturers in subjects such as English or Psychology usually do not see a role for their subjects in developing Environmental Literacy. In addition lecturers in "environmental" subjects such as Biology and Geography do not always understand their role in developing the affective domain while teaching their subjects. (This is fully discussed in section 6.4.1.2). By encouraging departments to have aims and objectives which include relevant aspects of Environmental Literacy it may be possible to encourage all disciplines to participate in Environmental Education.

7.2.2 Recommendations on the appointment of an Environmental Education Co-ordinator

The function of an Environmental Education Co-ordinator (Eeco-teacher) in a teacher's college was discussed in section 3.4.2.6. The most important function is to ensure that students receive the optimum amount of training through their various courses to make them Environmentally Literate.

- It is recommended that each college appoint an Eeco-teacher from amongst the ranks of the existing teaching staff.

The Eeco-teacher should be trained for the position and be highly motivated. A thorough knowledge of ecology would be an advantage.

Since his work as an Eeco-teacher would not occupy the incumbent's full time, his duties could be arranged to include the Eeco-teacher functions.

In addition to the general function mentioned above, the Eeco-teacher would provide information on all Environmental Education resources, and assist where necessary with the co-ordination of all inter-departmental Environmental Education efforts.

7.2.3 Recommendations on a special course in Environmental Education

This study has emphasised the fact that Environmental Education is not a separate school subject, but should be incorporated into all school work. Nevertheless:

- It is recommended here that a separate compulsory course in Environmental Education be introduced at all colleges.

The special course would provide information on, and insight into the total human environment and pave the way for didactics training in Environmental Education in later years (i.e. when they will be using all school subjects as vehicles for developing Environmental Literacy).

"The Criteria" stipulate that certain subjects should be compulsory in a programme if it is to meet certification requirements. Religious Instruction/Biblical Studies is one of these subjects. Religious Education is considered of fundamental importance in teacher-training. In a similar way a strong case, based on the discussions of Chapter Two of this study, can be made for Environmental Education.

In addition to the argument that Environmental Education is of fundamental importance in teacher-training and thus demands special attention, there is a secondary argument in favour of the inclusion of a special course in Environmental Education, rather than only the use of existing courses as vehicles for this purpose. Previous research in the field of Environmental Education in South Africa (e.g. Hurry, 1978 and 1980) has revealed that many educationists (including teacher trainers) do not understand Environmental Education fully. There is a tendency for educationists to teach environmental knowledge without dealing with environmental values, attitudes and behaviour. Furthermore environmental information is frequently presented in a splintered, disjointed manner, so that there is a potential danger that student teachers will not receive the knowledge or skills that they require for themselves to be effective in Environmental Education. The introduction of a special course, co-ordinated by a specially trained person, would obviate most of these problems.

The special course on Environmental Education should be based upon the guiding principles for Environmental Education (discussed in detail in sections 2.4.5 and 3.4.3), should be inter-disciplinary in nature, and should

have its contents controlled and selected by a committee chosen from departments such as Geography, Biology and History.+

The course would be developed together with those of Geography, Biology and History, so that there would be no repetition of content in these subjects. (For example it would not be necessary to introduce basic ecology into Biology or basic climatology into Geography; these topics would have been dealt with already in the Environmental Education course.)

The most expedient time to introduce such a course would be in the first year of teacher training. This would enable the students to build upon experience (in both contents and skills) in subsequent specialist courses.

If there are time constraints as far as the timetable is concerned, periods for Environmental Education could be adjusted with those of the other environmental subjects.

The development of a special course in Environmental Education could form the basis for future research. Such a study would be invaluable in futhering the cause of Environmental Education at teachers' colleges.

+ For an example of a special course in Environmental Education at a training college see Appendix F.

7.2.4 Recommendations on a more holistic approach to teacher-training.

Holistic education is discussed in full in section 2.4.6. It is emphasised that an holistic approach is considered essential for effective Environmental Education.

In Chapter 6 it was stated that, although most colleges discussed multi - and inter-disciplinary approaches during didactic courses, the B. Prim. Ed. programmes themselves lack an holistic approach in the learning-and-responding parts of their programmes.

- It is recommended that all college departments co-operate more on the contents of their individual syllabuses.

Lecturers in Environmental subjects such as History, Geography, Health and Biology should meet to discuss points of common interest, with particular reference to an holistic approach to environmental information. Teaching departments should also view their own programmes more holistically. A systems approach to teaching, exemplified by the JCE model, (figure 18) is one of the ways in which this can be done.

The "Wetenskapleer A" course at OG deals with, inter alia, interrelationships between disciplines (in this case the specialisation subjects). This course is a good example of an holistic approach to the acquisition of knowledge.

An earlier criticism of teaching in primary schools in South Africa (section 1.1.2) was that teachers do not relate information or skills from one school subject or subjects to others. To improve this situation:

- It is recommended that student teachers be obliged to teach at least one lesson, or a set of lessons, using an integrated, interdisciplinary approach and that this compulsory teaching have an environmental theme.

The lesson or lessons should be taught using skills and/or knowledge from all the school subjects (Geography, History, Art, English, Afrikaans, Mathematics, etc.). This should encourage teachers to use suitable opportunities for holistic teaching.

7.2.5 Recommendations on the provision of information on the total human environment

A characteristic of an Environmentally Literate person is that he has a reasonable knowledge and understanding of the structures (elements) and processes (interactions) in his environment.

In section 2.2.3 the point was made that information on the total human environment involved basic biological, geographical, historical, social and cultural information.

This study has revealed that not all colleges have compulsory "content" courses in subjects such as Geography or History.

Assuming that Environmental Literacy is one of the basic aims of teacher-training, then a thorough foundation of environmental information (and/or the skills needed to acquire this information) must be provided.

If there is no special course in Environmental Education then

- It is recommended that all colleges should have compulsory "content" courses in Geography, Biology and History.

In section 6.4.3 it was pointed out that soil studies are neglected by most colleges in the compulsory years of study.

- In order to improve this situation it is recommended than an introductory course in soils (in either Biology or Geography) be introduced.

This soils course need not be detailed, but should equip every teacher with a minimum amount of information on this integral part of the ecosystem.

In section 6.4.3 it was pointed out also that most courses in Biology neglect training in the use of maps, vertical air photographs and satellite images. To improve this situation:

- It is recommended that all first year Biology courses include the use of maps and photographs and other images.

At present all four B. Prim. Ed. programmes concentrate on the development of Western Civilisation in the first year. Teachers with only one year of History training may have little or no training in the History of South Africa.

- It is recommended that the impact of historical events on the South African environment be included in the first (compulsory) year of History.

The total environment is a product as much of historical events as any other factors, and a knowledge of local history is essential for the Environmentally Literate teacher.

(Note: In line with the discussion on the nature of Environmental Education in section 2.4, activities relating to geographical and ecological information on the local (i.e. Southern African) environment should be given more time in the curriculum than those relating to historical information on the same region. The contention is that Environmental Literacy requires a greater depth of knowledge of local Geography and Ecology than it does of local History. Notwithstanding this, local History must be seen as a basic component of Environmental Education.)

7.2.6 Recommendations on values education

Values education is described in this study as integral to effective Environmental Education (section 2.4.11).

This study contends that values education is a neglected field in teacher-training (see section 6.5.5). Although all four colleges deal with "values", the work is characterised by a theoretical approach and an absence of practical application. In addition discussion on values is usually confined to particular areas, such as the development of mores and norms in society at large.

Values clarification with regard to environmental issues is dealt with by one college only (JCE) but then only in a 3rd year (non-compulsory) course.

In order to ensure that all teachers are able to cope with values clarification in the didactic situation:

- It is recommended that values education should be taught as a basic skill during teacher-training.

Student teachers themselves should go through a process of values clarification whereby they consider the values they hold, the alternatives available to them and the consequences of the values or the alternatives.

Values education should be dealt with as a section on its own during work in Education or Pedagogics. (According to Kok, (pers. comm.) this is a neglected area which the Department of Pedagogics at RAU intends developing in the near future.) There should be close co-operation between the department teaching values education and environmentally orientated departments such as Biology and Geography.

Through this co-operation examples of values relating to environmental issues should be discussed, and students should be given simulated experiences in values clarification.

7.2.7 Recommendations on problem-solving

Problem-solving is discussed in section 3.4.3.4. This process can be viewed from two levels. On the one hand there is a general approach to problem-solving, regardless of the problem, while on the other hand there is an application of this skill to particular environmental problems.

Problem-solving at both levels should be a basic skill of all teachers.

In order to develop problem-solving skills, student teachers need to be exposed to a wide variety of problem-solving situations. The students need to be shown the analysis of problems into their component parts, the degree to which the individual can affect any of the components, and the strategies to be used to approach their solution.

- It is recommended that the Education departments of the colleges assume responsibility for training in problem-solving.

Suggestions and examples of problems that the student teacher may come across during training should be obtained from the other departments, especially subjects such as Geography, Health, Biology and History.

Environmental Literacy involves positive environmental behaviour. Without direct involvement in environmental issues, it is not possible to develop the values and attitudes that lead to this behaviour. A number of respondents to the questionnaire gave Environmental Literacy as an expressed aim of their programmes (e.g. Biology, JCE; Geography, OP). Despite this stated commitment, no departments are involved with local problem-solving activities. To ensure that they go beyond the cognitive level of instruction and that they work towards achieving their aim of truly Environmentally Literate student teachers:

- It is recommended also that all environmentally orientated disciplines involve themselves at some stage with problem-solving activities in the local environment.

Using techniques such as sampling methods, and skills such as values clarification, the students should examine local issues objectively and attempt to suggest solutions to problems.

The issues studied do not have to be complex. The value of the exercise lies in the practice students get in investigating problems, not in their size or complexity. Having experience of this nature they themselves would be better equipped to deal with problem-solving when they are teaching.

7.2.8 Recommendations on fieldwork

The importance of fieldwork is discussed in section 2.4.8. Fieldwork activities are essential for effective Environmental Education. All the knowledge, skills, attitudes and abilities are combined in the fieldwork experience.

Fieldwork does not relate only to work done at places distant from the school. Any work done outside of the classroom (e.g. in the school grounds) is also called fieldwork.

In sections 5.8.1.5 and 6.5.2 it was pointed out that not all students in the B. Prim. Ed. programme have experience of fieldwork or are trained in fieldwork management. There is no college with a developed outdoor education site where in-college fieldwork could be conducted.

- It is recommended that all students should be trained in fieldwork techniques so that they may apply their knowledge and skills to their own teaching. It is recommended further that students should receive experience of fieldwork in the local environment, particularly in the grounds of the college.

Training in fieldwork skills should be vested in either the Biology department or the Geography department. A co-ordinator should ensure that the full range of skills is covered. (For example mapping, sampling, representing data, etc.)

- It is recommended that all colleges develop on-site study areas.

- It is recommended that the student teachers receive full information on the current South African system of syllabus development and implementation, and on the modus operandi for implementing change.

It has been established that curriculum development is dealt with theoretically by all the colleges. Once students have discussed curriculum development in theory they should receive practical experience of the process. All students should be given experience in designing part of a class curriculum and in designing parts of syllabuses for that curriculum. Despite their lack of teaching experience, this activity should encourage an appreciation for the complexities of curriculum and syllabus development. The activity should equip them also to examine syllabuses critically and to offer suggestions on their improvement.

7.2.11 Recommendations on the evaluation of programmes

In the comprehensive model for teacher-training (figure 17) it was stressed that teacher-training programmes should be developed against the background of the needs and aspirations of the local community. It was also stressed that, within the context of this study, these needs and aspirations are related to the quality of life within the built environment.

In order constantly to evaluate the relevancy of teacher-training programmes it is essential for colleges to have on-going research programmes. At the same time it is useful for student teachers to keep in contact with the "real world" of the local community. It is possible to combine both of these in the student fieldwork situation.

- It is recommended that student teachers be involved in practical research projects in the local community.

The practical work would be aimed at giving the student teacher insights into the local community and, within the context of this study, insights into the relationships between the community and its environment, in particular the built-environment.

The practical work should be organised through the Education department and need only take place once during the four-year training programme. Constant contact between the students and the college lecturers would provide some of the "feed-back" required for programme evaluation.

A point that has been stressed a number of times in this study is that teacher-training should be relevant to the "real world". Students who are involved with a mini-research programme in this "world" should begin to see the relevancy of the work they do.

The practical work that student teachers do should not be complex in nature. Individual students should concentrate on elementary topics. Through "report back" periods after the research has been completed, students can gain an overall impression of a wide ranging number of topics.

Study areas which would be appropriate for individual or group research projects include:

- How young people measure their "quality of life".
- What young people see as desirable/undesirable in their neighborhood.
- What recreational facilities most people want within walking distance of their homes.
- The effects of "greening" of city blocks on human behaviour. (Window boxes, flower pots, etc. on the balconies and in the streets.)
- The extent to which people are willing to contribute towards environmental improvements, despite the possibility of personal sacrifice.
- The attitude of the local people towards issues such as water conservation, air pollution and littering..
- The attitude of local people to national issues such as mining in the Kruger National Park.

Fieldwork in the local community would give student teachers insights into conditions in the local environment. It would encourage them also to be relevant in whatever they teach. Despite the fact that most syllabuses are standardised throughout the province, teachers can be shown ways of teaching them within the context of local communities. Most important of all within the context of this study, teachers can be shown ways of developing positive environmental attitudes and values in their pupils, and could play a

vital role in generating enthusiasm for environmental improvement.

Their experiences in the local community should equip student teachers to make suggestions on their own training programmes.

- It is recommended that college lecturers involve their students (particularly their final year students) in constructive criticisms of their own training programmes.

Questionnaires, group discussions and interviews could be used as tools by the college lecturers in this assessment process.

7.3 FINAL CONCLUSIONS

This study was motivated by the claim of a number of educationists that South African teachers are insufficiently trained in Environmental Education. Although this opinion has not been substantiated through empirical research, there is sufficient evidence to substantiate the claim.

The study has concentrated attention on the B. Prim. Ed. programmes at four Transvaal colleges. It has identified a number of areas in which the programmes do not fullfil the requirements of Environmental Education. In fact there is evidence to support the view that Environmental Education is not a basic aim of these four colleges.

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In studying the four programmes, the researcher has gained valuable insights into teacher-training in general in the Transvaal province. Previous research (Hurry, 1978 and 1980) has shown that there are many similarities between Transvaal programmes and those of other provinces, and so this experience has significance for teacher-training in South Africa as a whole.

The most significant areas of concern in the teacher-training programmes that this study focussed on is the fact that no colleges have stated (printed) aims and objectives for their overall programmes. Such aims and objectives are necessary to help identify the knowledge, skills, attitudes and values deemed desirable in the students being trained. Without them it is difficult to ensure that all teaching departments within the college have the student teacher as the focus of their attention, rather than the particular programme they are teaching.

This research has led the writer to the conclusion that should the colleges list the general aims and objectives for their B. Prim. Ed. programmes, Environmental Literacy would not be one of them. This aim might well appear in a list for a specific course, such as Biology or Geography, but it is unlikely to be seen as a basic aim of the complete programme.

Until Environmental Education is accepted by all the colleges as of fundamental importance to all student teachers it will be difficult to press for improvements to existing B. Prim. Ed. programmes. In this respect most colleges agree that

"Religious Literacy", "Mathematical Literacy" and "Language Literacy" are desirable traits in all primary school teachers. Environmental Literacy must be added to this list if teachers are to play a responsible role in developing an environmentally responsible citizenry in South Africa.

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BIBLIOGRAPHY

AGNE, R.M. and NASH, R.J. 1976
"The teacher educator as an environmental activist".
Journal of Teacher Education. Vol. XXV11 No. 2, pp 141-146.

AMERICAN ASSOCIATION OF COLLEGES FOR TEACHER EDUCATION. 1968
Teacher education. Issues and innovations.
Washington, D.C. : AACTE.

BAKSHI, T.L. and NAVEH, Z. (eds.) 1978
Environmental Education. Principles, methods and applications.
New York : Plenum Press.

BANATHY, B.H., MILLS, S.R. and AARON, C.E. 1979
An institutionalisation of environmental education in the formal education sector.
Washington, D.C. : Office of Environmental Education.
United States Office of Education.

BARRY, J. (ed.) 1976
The Belgrade Charter. A global framework for Environmental Education. Connect. Vol. 1 No. 1, p 2.

BELL, P. 1978
"Competency based teacher education". In: White. D. (ed.)
The practice of teaching.
Salisbury: Longman. Rhodesia.

BERRY, M.F. 1979
"The pressing need for Environmental Education".
USA Today. May 1979, pp 50-52.

BIESHEUWEL, S. 1977
The role of the teacher in a changing world.
Cyclostyled notes, Graduate School of Business Administration,
University of the Witwatersrand.

BLACKBOURN, A. 1976
"Environmental studies in German Schools." In : Saveland, R.N. (ed.) : Handbook of Environmental Education.
London : John Wiley and Sons

BLOOM, B.S. (ed.) 1956
Taxonomy of educational objectives : Handbook 1 : cognitive domain.
London : Longman.

BLUME, R. 1974
"Humanising teacher education". In:Horton, L.and Horton, P. (eds.) : Teacher education. Trends,issues, innovations.
Danville, Illinois : The Interstate Publishers, Inc.

BONE, T. 1978
"What is good teaching?" In : White, D. (ed.)
The practice of teaching.
Salisbury : Longman, Rhodesia.

BOTHMA, J, DU P. 1977
"Conservation education on the academic level in Southern Africa."
In : de Graaf, G. de and van der Walt. P.T. (eds.). Koedoe Supplement: The state of nature conservation in South Africa.
Pretoria: National Parks Board of Trustees.

BOWMAN, M.L. and HANSELMAN, D.L. 1979
Values activities in Environmental Education.
Columbus, Ohio: ERIC Clearing house for Science, Mathematics and Environmental Education.

BOYCE, A.N. 1976
"Conflicting values in the education of teachers". Symposium 1975-76, pp 53-58.

BROWN, L.M. and REECE, J. 1978
"An interdisciplinary model for teacher education."
Journal of Teacher Education. Vol. XX1X No. 6, pp 51-52.

BROWN, N.J. 1977
"The challenge of our Future".
In: Aldrich, J.L., Blackburn, A.M. and Abel, G.A. (eds.)
The report of the North American regional seminar on Environmental Education.
Columbus, Ohio: ERIC Clearing house for Science, Mathematics, and Environmental Education.

BORKE, H.and BURSTYN, J.W. 1974
"The new teacher and interpersonal relations in the classroom."
In: Horton,L. and Horton, P.(eds.) : Teacher education. Trends, issues and innovations.
Danville, Illinois : The Interstate Printers and Publishers Inc.

CARSONS, S. McB. 1978
Environmental Education. Principles and practice.
London : Edward Arnold.

CASTON, E. 1979
"An interdisciplinary approach to education". Museum News,
March - April 1979.

CHILDRESS, R.B. 1978
"Public School environmental education curricula: A national
profile." The Journal of Environmental Education. Vol. 9 No. 3,
pp 2 -11.

CLAYTON, J.F. 1979
Outdoor education in the United States of America, Canada
and Britian.
M.Ed. Thesis. University of South Africa.

CLEARY, J.W. 1976
"Teacher education." In : Saveland, R.N. (ed.)
Handbook of Environmental Education.
London: John Wiley and Sons.

COLLINS, K.T., DOWNES, L.W., GRIFFITHS, S.R. and SHAW, K.E. 1973
Key words in education.
London : Longman.

COMBES, J.J. 1977
"Some views about limits".
In: Aldrich, J.L., Blackburn, A.M. & Abel, G.A. (eds.)
The report of the North American regional seminar on
Environmental Education.
Columbus, Ohio : ERIC Clearing house for Science, Mathematics and
Environmental Education.

COMBS, A.W. 1981
"What the future demands of education". Phi Delta Kappa.
January 1981, pp 369-372.

COMMITTEE OF EDUCATIONAL HEADS. 1978
Criteria for the evaluation of South African qualifications
for employment in education.
Pretoria. Government Printer.

COMMONWEALTH SECRETARIAT. 1974
Teacher education in the changing society.
London.

COOMBES, P. 1968
The world educational crisis.
Oxford, Oxford University Press.

COON, H.L. and BOWMAN, M.L. 1976
Environmental Education in the urban setting : Rationale
and teaching activities.
Columbus, Ohio : ERIC Clearing house for Science, Mathematics
and Environmental Education.

COUNCIL FOR ENVIRONMENTAL QUALITY. 1979
First Annual Report.
Washington.

CROPLEY, A.J. and DAVE, R.H. 1978
Lifelong education and the training of teachers.
Oxford : Pergamon Press.

DAVIES, D. (ed.) 1972
A dictionary of anthropology.
Essex : The Anchor Press.

DE BONO, E. 1976
Teaching thinking.
Harmondsworth : Penguin Books.

DE NEVI, D. 1974
"Towards planning a new model for teacher education". In :
Horton, L. and Horton, P. (eds.) Teacher education.
Trends, issues, innovations.
Danville, Illinois: The Interstate Printers and Publishers, Inc.

DICKSON, G.E. 1979
"CBTE revisited. Toledo's program remains strong."
Journal of Teacher Education. Vol. XXX No. 4, pp 17-19.

DISINGER, J.F. 1981
"Environmental Education for the eighties". Journal of
soil and water conservation. Vol. 36 No. 1, pp 9-12.

DUMINY, P.A. and SÖHNGE, W.F. 1980
Didactics : Theory and Practice.
Cape Town : Longman.

DUSHKIN PUBLISHING GROUP. 1973
Encyclopaedia of physchology.
Connecticut.

EDUCATIONAL TECHNOLOGY REVIEWS SERIES. 1973
Number four : Teacher education and educational technology.
Englewood Cliffs, New Jersey : Educational Technology Publications.

ENGELBRECHT, S.W.B. and LUBBE, A.N.P. 1978
General method and school organisation.
Parow : via Afrika.

EVANS, D.R., HEARN, M.T., UHLEMANN, M.R., and IVEY, A.E. 1979
Essential interviewing : A programmed approach to effective communication.
Monterey, California : Brooks/Cole Publishing company.

FARRANT, J.S. 1964
Principles and practice of education.
London : Longmans.

FENSHAM, P.J. and MAY, J.B. 1979
"Servant, not master. A new role for science in a core of Environmental Education." The Australian Science Teacher's Journal. Vol. 25 No. 2 pp 15-24.

FISHER, D. 1978
Environmental education. Guidelines for the Primary and Middle years.
Hertfordshire : Hertfordshire County Council.

GARDNER, R. 1979
Teacher education in developing countries. Prospects for the eighties.
London : University of London Institute of Education.

GLUCKMAN, H. 1980
"Into the future : The making of a teacher." Transvaal Educational News. Vol. LXXV11 No. 10, pp 19 - 21.

GOOD, C.V. 1973
Dictionary of education. (Third edition)
New York: McGraw Hill.

GREESE, D. 1977
"The Rand Afrikaans University pattern of teacher training".
In: University of Zimbabwe, Conference on the Practice of teaching, 1977: The short papers, Part II, Paper II.
Zimbabwe: University of Zimbabwe.

GUTEK, G.L. 1974
Philosophical alternatives in education.
Columbus, Ohio: Charles Merrill.

HABERMANN, M. and STINNETT, T.M. 1973
Teacher education and the new profession of teaching.
Berkley, California: McMutchan Publishing Corporation.

HAEFELE, D. 1968 (a)
"Teacher education and systems." In: American Association of Colleges for Teacher Education. Systems and modelling: Self renewal of teacher education.
Washington, D.C. : AACTE

HAEFELE, D. 1968 (b)
"Synthesis and summary." In: American Association of Colleges for Teacher Education. Systems and modelling: Self renewal of teacher education.
Washington, D.C. : AACTE

HANSELMAN, D.L. 1979
"Foreword." In: Bowman, M.L. Values activities in Environmental Education.
Columbus, Ohio: ERIC Clearing house for Science, Mathematics and Environmental Education.

HARRIS, A. 1972
"Autonomy". In: Open University Press. Curriculum philosophy and design. Unit 8.
Beetchley, Buckinghamshire: Open University Press.

HARVEY, G.D. 1977
"A conceptualisation of Environmental Education."
In: Aldrich, J.L., Blackburn, A.M. and Abel, G.A. (eds,)
The report of the North American regional seminar on
Environmental Education.
Columbus, Ohio: ERIC Clearing house for Science, Mathematics
and Environmental Education.

HIBBS, C.W. 1975
Certification in environmental education: A challenge and
an opportunity.
Cyclostyled paper, Ball State University, Muncie, Indiana.

HOPKINS, C.A. 1977
"Environmental Education in the school system." In: Aldrich, J.L.;
Blackburn, A.M.; and Abel, G.A. (eds.) The report of the
North American regional seminar on Environmental Education.
Ohio: ERIC Clearing house for Science, Mathematics and
Environmental Education.

HORTON, L. 1974
"The hidden curriculum of competency based teacher education."
In: Horton, L. and Horton, P. (eds.) : Teacher education.
Trends, issues, innovations.
Danville, Illinois: The Interstate Printers and Publishers Inc.

HORTON, L. and HORTON, P. (eds.) 1974
Teacher education. Trends, issues, innovations.
Danville, Illinois: The Interstate Printers and Publishers, Inc.

HOWSAM, R.B. 1968
"Teacher education and systems." In: American Association of
Colleges for teacher Education. Systems and modelling:
Self renewal of teacher education.
Washington, D.C. : AACTE.

HUBERMANN, M. 1970
Reflections on the democratization of secondary and higher
education.
Paris: Unesco.

HUGHES-EVANS, D. (ed.) 1977
Environmental Education. Key issues of the future.
Oxford : Pergamon Press.

HUMAN SCIENCES RESEARCH COUNCIL. 1981 (a)
Vol. 1 : Provision of education in the RSA.
Report of the Main Committee of the HSRC investigation
into education.
Pretoria : HSRC.

HUMAN SCIENCES RESEARCH COUNCIL. 1981 (b)
Vol. 2 : Principles for the provision of education in the
RSA. Report of the work committee : Education principles
and policy, of the HSRC investigation into education.
Pretoria : HSRC.

HUMAN SCIENCES RESEARCH COUNCIL. 1981 (c)
Vol. 13 : Werwing en opleiding van onderwysers.
Report of the work committee : Teacher training, of the HSRC
in investigation into education.
Pretoria : HSRC.

HUNGERFORD, H.R. and PEYTON, R.B. 1977
"Environmental education: A paradigm" In: Aldrich, J.L.,
Blackburn, A.M. and Abel, G.A. (eds.) : The report of the
North American regional seminar on Environmental Education.
Columbus, Ohio : ERIC Clearing house for Science, Mathematics
and Environmental Education.

HUNGERFORD, H; PEYTON, B. and WILKE, R.J. 1980
"Goals for curriculum development in Environmental Education."
Journal of Environmental Education. Vol. II No. 3, pp 42 - 47.

HUNGERFORD, H.R. and PEYTON, R.B. 1980
Strategies for developing an Environmental Education curriculum.
Paris : UNESCO.

HURRY, L.B. 1978
Is Conservation Awareness one of the aims of formal education
in South Africa? An assessment with special reference to
Biology and Geography teaching.
Johannesburg: Wildlife Society of Southern Africa.

HURRY, L.B. 1979
"Conservation Awareness and Geography teaching in South Africa".
The South African Geographer. Vol. 7. No. 1. pp 80 - 87.

HURRY, L.B. 1980
Environmental Education in Transvaal secondary schools and its relation to the teaching of Biology and Geography.
M.ED. thesis. University of South Africa.

HUSEN, T. 1979
"Patterns and structures for teacher education." In:
Gardner, R (ed.) Teacher education in developing countries. Prospects for the eighties.
London: University of London Institute of Education.

IRWIN, P.R. 1982
Conservation Awareness amongst white adolescents in South Africa: A study of senior secondary pupils in Natal.
M.Ed thesis. University of Natal, Pietermaritzburg.

JERNIGAN, H.D. and WIERSCH, L. 1978
"Developing positive student attitudes towards the environment."
The American Biology Teacher. Vol. 40 No. 1, pp 30 - 35.

JESSKE, W.E. (ed.) 1978
Toward an action plan: A report on the intergovernmental conference on environmental education.
Washington, D.C. : U.S. Department of Health, Education and Welfare.

JOHANNESBURG COLLEGE OF EDUCATION. 1978
Curriculum: Diploma in Education, Higher Diploma in Education (Senior, Junior Primary and Pre-Primary Specialisation).
Johannesburg : Johannesburg College of Education.

JOOSTE, J.H. 1974
"Rationalisation of teacher-training with a view to the meaningful combination of courses for appointment of intending teachers by the education department." Bulletin of the Transvaal Education Department. Vol. XV111 No. 3, pp 104 - 115.

JORDAAN, S.P. and ALBERTS, H.W.N. 1982
Didactics of Geography in the Primary School.
Pretoria. de Jager-Haum.

JOYCE, B. and WEIL, M. 1980
Models of teaching. (Second edition)
Englewood Cliffs, New Jersey : Prentice-Hall, Inc.

KAHN, R.L. and CANNELL, L.F. 1967
The dynamics of interviewing.
New York : John Wiley & Sons.

KATZ, M.S. 1978
"Teaching people to think of the future: Some guidelines for teacher education." Journal of Teacher Education. Vol. XX1X No. 4, pp 57 - 61.

KAZIMIAS, A.M. 1971
"Education in international perspective: Focus on change and modernisation."
In : Kneller, G.F. (ed.) Foundations of Education.
New York : John Wiley and Sons.

KNELLER, G.F. 1978
Educational anthropology : An introduction.
New York : Krieger Publishing Company.

KOEKEMOER, D.F.P.; VAN DER MERWE, P.J.; VAN DER STOEP, F.; VAN ZYL, P.J.; KRUGER, R.A.; CALITZ, L.P.; GOOSEN, C.J. 1979
Die lesstruktuur.
Pretoria : Onderwyskollege Goudstad.

KRATWOHL, D,R,; BLOOM, B.S. and MASIA, B.B. 1964
Taxonomy of behavioural objectives. Handbook II : Affective domain.
London : Longman.

LEBARON, W.A. and KLATT, J. 1971
A short summary of ten model teacher education programmes.
Washington: National Centre for education research and development, US Department of Health, Education and Welfare.

LEOPOLD, A. 1970
A sand county almanac.
New York : Ballantine Books.

LINKE, R.D. 1974
Environmental Education in Australia. Part 1 : A national survey of Environmental Education in Australia 1973/74.
Cyclostyled paper. Report for the Australian Conservation Foundation.

MANONE, C.J. 1970
"Promising prospects in Eastern African Teacher Education for the 1970's". In: Manone, C.J. (ed.) Proceedings of the Universities of Eastern Africa conference on teacher education.
Kampala: National Institute of Education.

MARAIS, J.F. 1978
Verslag oor die ondersoek na die vakwetenskaplike en vakdidaktiese opleiding van natuur- en skeikunde, wiskunde- en biologie-onderwysers.
Potchefstroom: Department of Zoology, University of Potchefstroom.

MARSDEN, W.E. 1976
Evaluating the Geography curriculum.
Edinburgh:Oliver and Boyd.

MCCABE, R.H.; KELLY, J.T. and LYONS, D. (eds.) 1977
Man and environment: Teaching alternatives.
Columbus, Ohio: ERIC Clearing house for Science, Mathematics and Environmental Education.

MCPHIE, W.E. 1974
" "Micky Mouse" and teacher education." In: Horton, L.and Horton, P. (eds.). Teacher education. Trends, issues, innovations.
Danville, Illinois: The Interstate Printers and Publishers, Inc.

MILLAR, J.C.U. 1980
The objectives of outdoor education.
Unpublished paper read at a conference on outdoor education.
Pretoria: University of South Africa.

NATIONAL EDUCATION COMMISSION (REPUBLIC OF BOPHUTHATSWANA) 1978
Education for Papagano.
Mmabatho : Bophuthatswana Government Service .

NIGHTINGALE, C.S. 1977
An analysis of the education potential of sites in the Cape Peninsular for secondary school fieldwork in environmental studies.
M.A. thesis. University of Cape Town.

NOBLE, A. 1972
Teacher training: Objectives and objections.
Grahamstown: Rhodes University Press.

OBERHOLZER, C.K. 1968
Prolegomena van 'n prinsipiele pedagogiek.
Cape Town : Haum.

OLSON, P.A. 1974
"The tri-university project in elementary education."
In: Horton, L.and Horton, P. (eds.). Teacher education. Trends, issues innovations.
Danville, Illinois : The Interstate Printers and Publishers, Inc .

PENNSYLVANIAN DEPARTMENT OF EDUCATION and CITIZEN EDUCATION. 1979
Curricular dimensions of global education.
Pennsylvanian : Research for Better Schools, Inc.

PEYTON, R.B. and MILLER, B.A. 1980
Developing an internal locus of control as a prerequisite to environmental action taking.
East Lansing, Michigan: Cyclostyled paper of the Michigan State University.

PRETORIA COLLEGE OF EDUCATION. 1981
Subject curricula for senate.
Pretoria: Pretoria College of Education.

PRETORIA (UNIVERSITEIT VAN). 1982
Jaarboek 1982: Fakulteit Opvoedkunde, Deel IX.
Pretoria: Universiteit van Pretoria.

RANDSE AFRIKAANSE UNIVERSITEIT. 1982
Jaarboek, 1982.
Johannesburg: Randse Afrikaanse Universiteit .

RAMSEY,J: HUNGERFORD, H. and TOMERA, A. 1980
The effects of environmental case study instruction on the overt environmental behaviour of eighth grade students .
Carbondale, Illinois: Cyclostyled paper from the Science Department, University of Southern Illinois.

RATHS, L.E.; HARMIN, M. and SIMON, S.B. 1978
Values and teaching: Working with values in the classroom. (Second Edition.)
Columbus: Charles Merrill Publishing Company.

REAVIS, S.; and WHITTACRE F.R. 1974
"Professional education of teachers. A spiral approach." In: Horton, L. and Horton, P. (eds) : Teacher education. Trends, issues, innovations.
Danville, Illinois: Interstate Printers and Publishers, Inc.

RENTSCH, W.A. 1973
An instrument to measure the minimal understanding and knowledge possession levels in ten environmental concept categories of an environmentally literate citizenry.
D. Phil. thesis, School of Natural Resources, Michigan University, Ann Arbor.

REYNOLDS, M.C. 1978
"Basic issues in restructuring teacher education". Journal of Teacher Education. Vol. XXIX no. 6, pp 25-29.

RICHETTO, G.M. and ZIMA, J.P. 1976
Fundamentals of interviewing.
Chicago : Research Science Associates.

RIMER, T. 1980
"An integrated approach to Environmental Education." Educational Journal. Vol. 51, No. 7, pp 17-30.

ROBERTS, R. 1980
"Teacher education in Queensland, Australia." Mentor. April 1980, pp 66 - 67.

ROMINE, S. 1974
"A multiphase consideration of teacher education." In: Horton, L. and Horton, P. (eds.) : Teacher education. Trends, issues, innovations.
Danville, Illinois: Interstate Printers and Publishers, Inc.

ROWLAND, J.W. (ed.) 1974
The conservation ideal. Being the SARCCUS record for the period 1952 - 1970.
Pretoria : Southern African Regional Commission for the Conservation and Utilisation of the Soil.

RUSSEL, D. 1980
"Educating for vision". Transvaal Educational News. Vol. LXXVII No. 10, pp 18 - 19.

SAVELAND, R.N. (ed.) 1976
Handbook of environmental education.
London : John Wiley and Sons .

SCHREUDER, D.R. 1977
Ongewingskultivering en die omgewingsvraagstuk met besondere verwysing na die rol van biologie-onderrig in die opleiding van primêre skool onderwysers.
M.Ed. thesis. University of South Africa.

SCOTTISH EDUCATION DEPARTMENT. 1974
Environmental Education: A report by H.M. Inspector of schools.
Edinburgh: Her Majesty's Stationery Office.

SEYMOUR, T. 1978
"What is good teaching in the primary school?" In : White, D. (ed. The practice of teaching. Salisbury: Longman Rhodesia.

SHANE, H.C. 1968
"Designing changes in teacher education through future planning: The role of systems theory." In: The American Association of Colleges for Teacher Education. Systems and modelling: Self renewal of teacher education.
Washington, D.C. : AACTE.

SIMON, S.B.; HOWE, L. and KIRSCHENBAUM, H. 1972
Values clarification: A handbook of practical strategies for teachers and students.
New York : Hart Publishing Company.

SMART, N.D.J. 1979
"Teachers, teacher education and the community". In: Gardner, R. (ed.). Teacher education in developing countries. Prospects for the eighties.
London: University of London.

SMITH, D.H. 1968
"Preparation of teachers for the central city". In: The American Association of Colleges for Teacher Education: Systems and modelling: Self renewal of teacher education.
Washington, D.C. : AACTE.

SMYTH, J.C. 1977
"Environmental Education. A major advance."
In: Aldrich, J.L.; Blackburn, A.M. and Abel, G.A. (eds.)
The report of the North American regional seminar on Environmental Education.
Columbus, Ohio : SMEAC Information Reference centre.

STAPP, W.B. 1977
"Environmental Education: A major advance." In: Aldrich, J.L.; Blackburn, A.M. and Abel, G.A. (eds.) : The report of the North American regional seminar on Environmental Education.
Columbus, Ohio : ERIC Clearing house for Science, Mathematics and Environmental Education.

STAPP, W.B. 1978 (a)
An instructional programme approach to Environmental Education (K-12) based on an action model.
Ann Arbor, Michigan: Cyclostyled paper, School of Natural Resources, University of Michigan.

STAPP, W.B. 1978 (b)
What is Environmental Education?
Cyclostyled information brochure on the work of the School of Natural Resources.
Ann Arbor : University of Michigan.

STAPP, W.B. and COX, D.A. 1979
Environmental Education activities manual.
Farmington Hills, Michigan: Stapp and Cox.

STAPP, W.B.: CADUTO, M.J.: MANN, L.D. and NOWAK, P.F. 1980
An analysis of pre-service Environmental Education of teachers in Europe and an instructional model for furthering this education.
Ann Arbor, Michigan: Cyclostyled paper, School of Natural Resources, University of Michigan.

STEINHART, J.S. and CHERRNIACK, S. 1969
The universities and environmental quality. Commitment to problem focussed education. (A report to the President's environmental quality council.)
Washington, D.C. : U.S. Government printing office.

STEWART, C.J. and CASH, W.B. 1974
Interviewing. Principles and practices. (Second edition)
Duboque, Iowa: Wm. C. Brown.

SWAN, J.A. and STAPP, W.B. (eds.) 1974.
Environmental Education. Strategies towards a more livable future.
New York: John Wiley and sons.

THEODORSON, C.A. and THEODORSON, A.G. (eds.) 1967
A modern dictionary of sociology.
London : Methuen.

THOMPSON, B. 1978
"What is good teaching in the secondary school?" In: White, D. (ed.) The practice of teaching.
Salisbury : Longman Rhodesia.

TINLEY, K.L. 1974
(Ecology) : The study of the "incomprehensible" by the "Incompetent."
Pretoria : Mimeograph of the proceedings of a symposium of SARCCUS.

TRANSVAAL EDUCATION DEPARTMENT. 1973
Die kurrikulum van die Primêre skool.
Pretoria: T.E.D.

TRANSVAAL EDUCATION DEPARTMENT. 1979
Report of a mission to overseas countries 6 April - 5 June 1979. Part 2: Teacher Training. Vol. 2: A training model for primary school teachers from an aims perspective.
Pretoria: Transvaal Education Department .

TURNER, W.E. 1980
"Expanding our horizons through global education." Principal. Vol. 60, No. 2, pp 32-35.

UNESCO-UNEP. 1976
"The Belgrade Charter. A global framework for Environmental Education." Connect. Vol. 1, No. 1, pp 1-2.

UNESCO-UNEP . 1977
Education and the challenge of environmental problems : International conference on environmental education, Tbilisi (USSR) 14-26 October 1977.
Paris : UNESCO.

UNESCO-UNEP. 1980
Strategies for developing an Environmental Education Curriculum. A discussion guide for UNESCO training workshops on Environmental Education.
Paris: UNESCO.

VAN DER MERWE, P.J. 1981
Doelstellings vir onderwysersopleiding.
D.Ed. thesis. Randse Afrikaanse Universiteit.

VAN RENSBURG, C.J.J., KILIAN, C.J.G. and LANDMAN, W.A. 1979
Notes on fundamental pedagogic concepts. An introductory orientation.
Pretoria : N.G. Kerk Boekhandel.

VENTER, E.H.H. 1976
Die ekologiese krisis en die opvoedkundige implikasies daarvan. 'n Empiriese studie.
M.Ed. thesis. University of South Africa.

VILJOEN, T.A. and PIENAAR, J.J. 1971
Fundamental pedagogics.
Durban : Butterworths.

VOLLMAR, F. 1976
Conserving one earth.
Morges, Switzerland: World Wildlife Fund.

WARFIELD, J.N. 1980
Designs for the future of Environmental Education. Volume 1. Report No. UVA/522032/EE80/127.
Washington, D.C. : Department of Education.

WARFIELD, J.N. 1981
Institutionalising Environmental Education.
Iowa : Cyclostyled paper, Department of Management, University of Northern Iowa.

WATER AFFAIRS, FORESTRY AND ENVIRONMENTAL CONSERVATION (DEPT. OF) 1982
Environmental Conservation Act; Act No. 100 of 1982.
Pretoria: Government Printer.

WEIL, W, and BRUCE, J. 1978.
Information processing models of teaching. Expand your teaching repertoires.
Englewood Cliffs, New Jersey : Prentice Hall, Inc.

WEINBERG, C. 1971
"Social change".
In: Kneller, G.F. Foundations of education.
New York : John Wiley and Sons.

WHEELER, K. 1980
"Teacher training for Environmental Education." Review of Environmental Education developments. Vol. 10 No. 1, pp 16-17.

WHITE, D. (ed.) 1978
The practice of teaching.
Salisbury : Longman Rhodesia.

WILDLIFE SOCIETY OF SOUTHERN AFRICA. 1976
Proceedings: Conservation education symposium.
Johannesburg.

WILDLIFE SOCIETY OF SOUTHERN AFRICA. 1979
A national strategy for environmental conservation in South Africa. Johannesburg.

WINICK, C. (ed.). 1956
Dictionary of anthropology.
Connecticut : Greenwood Press.

WITWATERSRAND (UNIVERSITY OF). 1982
Faculty of education. Rules and Syllábuses. 1982.
Johannesburg : University of the Witwatersrand.

YEE, A.H. 1974
"A model for the development of teacher education relevant to the 70's". In : Horton, L. and Horton, P. (eds.) : Teacher education. Trends, issues, innovations.
Danville, Illinois : The Interstate Printers and Publishers, Inc.

YULE, R.M. 1979
Didactics in comparative education. H.E.D. Guide 1.
Pretoria : University of South Africa.

APPENDIX A

PERSONAL COMMUNICATIONS - OVERSEAS COUNTRIES

ABU BAKAR C.	Lecturer in Agriculture. University of Kuala Lumpur.
ANASTASIA C.J.	Professor of Science Education. University of British Columbia. Vqncouver, BC.
BARTON A.	Programme director, National Science Foundation. Washington. D.C.
BOGAN W.	Director of Environmental Education. United States Federal Government. Washington, D.C.
BERGER K.	Dean of the Faculty of Education. University of Michigan. Ann Arbor, Michigan.
BOWMAN M.L.	Associate Professor of Environmental Education. Ohio State University. Columbus, Ohio.
BLOSSER P.	Associate director for user services. ERIC/SMEAC. Columbus, Ohio.
CAROL J.	National co-ordinator of Environmental Education, US Forest service. Washington D.C.
CARY W.	Co-ordinator for School Science. Bloomington school district. Bloomington, Indiana.
CULLEN J.	Lecturer. Touch of Nature Outdoor Education Centre. Carbondale, Southern Illinois.
CUTHBERTSON H.	Chief education officer. State museum, Victoria. Victoria, British Columbia.

CROWFOOT J.	Senior lecturer, Department of Natural Resources. University of Michigan. Ann Arbor, Michigan.
DETLEFSE J.	Office of solid waste resource recovery branch. Environmental Protection Agency. Washington, D.C.
DISINGER J.F.	Associate director of ERIC/SMEAC. Columbus, Ohio.
HEATHERINGTON M.	Associate professor of Education. Michigan State University. East Lansing, Michigan.
HUG J.	Superintendent of Elementary and Secondary Education. Ohio State. Columbus, Ohio.
HUNGERFORD H.	Professor of Education. University of Southern Illinois at Carbondale. Carbondale, Southern Illinois.
JESKE W.	Head of Publications and Educational Relations. US Department of Agriculture. Washington, D.C.
LANGUIST M.	Professor of Early and Middle Childhood Education. Ohio State University. Columbus, Ohio.
LITHERLAND R.	Assistant administrator, Carbondale Elementary Schools. Carbondale, Southern Illinois.
LOWE G.	Department of Education. Federal Government of the USA. Washington, D.C.
LUGINBILL G.	Co-ordinator for Environmental Education. Bloomington school district. Bloomington, Indiana.
LUKCO B.	Officer. Environmental Protection Agency. Columbus, Ohio.

MACLAREN M.	Professor of Education. Simon Fraser University. Vancouver, British Columbia.
MCSWAIN J.	Education consultant. American Forest Institute. Washington D.C.
MULLINS G.	Associate professor of Natural Resources. Ohio State University. Columbus, Ohio.
NOWAK P.	Senior Lecturer. School of Natural Resources. University of Michigan. Ann Arbor, Michigan.
PEYTON B.	Professor of Forestry. Michigan State University. East Lansing, Michigan.
RANDOLPH J.C.	Director, School of Public and Environmental Affairs. University of Indiana, Bloomington, Indiana.
SANDLER A.	Education consultant. Institute of American Architects. Washington, D.C.
SHEPHERD C.	Associate professor of Forestry. Ohio State University. Columbus, Ohio.
STAPP W.	Professor: School of Natural Resources. Michigan University. Ann Arbor, Michigan.
STONE J.	Educational consultant. National Wildlife Federation. Washington, D.C.
VOSS B.	Professor of Science Education. University of Michigan. Ann Arbor. Michigan.
WEILBACHER M.	Master of Education student. School of Natural Resources. University of Michigan Ann Arbor. Michigan.
WINSLOW D.	Professor of Education. University of Indiana. Bloomington, Indiana.
ZEPH P.	Student. Department of Natural Resources, University of Michigan. Ann Arbor, Michigan.

APPENDIX B

PERSONAL COMMUNICATIONS - SOUTH AFRICA

BOOYSE, E.A.	Vice Rector, Onderwyskollege Goudstad.
BOYCE, N.	Rector, Johannesburg College of Education.
BUWALDA, R.	Department of Education, Johannesburg College of Education.
COETZEE, J.E.	Department of Biology, Onderwyskollege Goudstad.
CRONJE, W.A.	Vice-Rector, Onderwyskollege Goudstad.
DE KLERK, J.	Department of Psychology, Onderwyskollege Goudstad.
DICKSON, P.	Department of History, Pretoria College of Education.
FAIRHURST, J.	Head of Department of Geography, Pretoria College of Education.
GELDENHUYS, A.M.	Department of Psychology, Onderwyskollege Pretoria.
JELLEY, R.	Department of Communications, Pretoria College of Education.
JOHNSTON, A.	Department of Education, Johannesburg College of Education.
KOK, J.C.	Department of Education, Randse Afrikaanse Universiteit.
LEWIN, J.	Department of Education, Johannesburg College of Education.
MULDER, I.	Department of Education, University of Pretoria.
PAINE, K.R.	Rector, Pretoria College of Education.
PAPENFUS, J.	Head of Department of Biology, Pretoria College of Education.
PIENAAR, A.T.	Department of Geography, Onderwyskollege Goudstad.
POHORILLE, R.	Senior Lecturer, Department of Geography, Johannesburg College of Education.
POTGIETER, J.	Department of Biology, Pretoria College of Education.
REYNEKE, S.	Mediacentre, Onderwyskollege Goudstad.
ROGERS, C.	Head of Department of Geography, Johannesburg College of Education.
ROOS, S.G.	Department of Fundamental Pedagogics, University of Pretoria.
SCOTT, A.M.	Head of Department of Biology, Johannesburg College of Education.
SCHOEMAN, H.M.	Head of Department of Geography, Onderwyskollege Pretoria.
THOMAS, A.M.	Head of Department of Biology, Onderwyskollege Pretoria.
VAN DER LINDE, P.	Department of Empirical Education, Pretoria College of Education.
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APPENDIX C

RESEARCH QUESTIONNAIRE USED IN ASSESSING SELECTED B. PRIM. ED. PROGRAMMES IN THE TRANSVAAL.

RESEARCH QUESTIONNAIRE - PAGE 1

The Modus Operandi

The drawing up of the research questionnaire involved a number of steps:

i. Once the key elements for effective Environmental Education had been identified, an interview questionnaire was compiled.

ii. The interview questionnaire was used to interview the rectors of the four colleges. In the light of these experiences the questionnaire was altered and improved. In its improved form the questionnaire became the research questionnaire.

iii. During the interviews with the rectors of the colleges the names of members of staff who might have been of assistance in the research were suggested and a list of names and addresses and telephone numbers was compiled.

iv. These research questionnaires were then sent to the various people on the list. A stamped, self-addressed envelope was enclosed for easy reply.

RESEARCH QUESTIONNAIRE - PAGE 2

RESEARCH INTO ENVIRONMENTAL EDUCATION WITH REGARD TO
TEACHER – TRAINING.
(WITH SPECIAL EMPHASIS ON THE B. PRIM. ED. PROGRAMME)

1. Researcher: L.B. Hurry – Dept. of Didactics UNISA.

2. Title of thesis: (D.Ed.) Directions in Environmental Education and their implication for the training of primary school teachers in the Transvaal.: Towards a synthesis.

3. Working definition of Environmental Education (EE) :

   Environmental Education is a process aimed at developing a world population that is aware of, and concerned about the total environment and its associated problems, and which has the knowledge, attitudes, motivations, commitments and skills to work individually and collectively towards solutions of current problems and the prevention of new ones.."

4. Major goal of EE:

   "To produce an Environmentally Literate citizenry that is both competent to take action on critical environmental issues and willing to take that action".

5. Environmental Literacy

   This thesis maintains that EE is NOT a separate school subject but that it is a fundamental process which permeates ALL subjects. The responsibility for EE, while largely the domain of Geography and Science teachers, also falls into the camps of the English, History, Religious Instruction and other subject teachers.

   For this reason it is the contention that all training teachers should be trained to be "Environmentally Literate", i.e. competent to take action and willing to take it, particularly with regard to Environmental Education in schools

RESEARCH QUESTIONNAIRE - PAGE 3

6. Elements in the thesis
   - 6.1 Investigate developments in EE in different parts of the world.
   - 6.2 Develop a model for teacher training which has the optimum amount of EE in it.
   - 6.3 Examine four B.Prim. Ed. programmes in the Transvaal to see how they fit the model.

7. B. Prim. Ed. programmes. Two basic areas of research.

   (Sections A and B of the enclosed questionnaire relate to these two sections.)
   - 7.1 Training the student teachers to be "Environmentally Literate citizens". (See points 4 and 5 above).
   - 7.2 Training the teachers in Environmental Education. (The teacher-training model)

RESEARCH INTO TEACHER EDUCATION (BACHELOR OF PRIMARY EDUCATION COURSE : L.B. HURRY)

(Please write N/A (Not applicable) where questions do not apply to you.)

i. Name of respondent : (Miss. Mrs. Mr. Dr. Prof.)

ii. Address of college/university:

iii. Telephone number:

iv. Position held c college/university:

v. Subject taught : (E.g. Psychology, Geography, Visual Aids, Biology Methodology)

vi. Is your subject compulsory? Please give details. (Year(s) in which it is taken, etc.)

RESEARCH QUESTIONNAIRE - PAGE 4

SECTION A : THE TRAINING OF ENVIRONMENTALLY LITERATE (EL) TEACHERS.

These questions relate to information that student teachers require in order to be Environmentally Literate.
Please note: All answers should fit into the space provided If they do not, please use a separate sheet of paper.

1. AIMS AND OBJECTIVES

1.1 Do you have stated aims and/or objectives for your subject?

1.2 If "yes", is the training of "Environmentally Literate" (EL) teachers one of your aims?
(Please give details)

2. THE DIDACTIC SITUATION

SELECTED ELEMENTS FOR EE

A number of elements have been identified as being of basic importance in training EL teachers. Some of these elements relate to didactic situations while others relate to organisation within your department.

2.1 Provision of BASIC INFORMATION on the total human environment; physical, biological and cultural.

Do parts of your programme deal with the following components of the total human environment. If so please give details:

2.1.1 Bio-physical environment?

2.1.2 Social or cultural environment?(E.g. Sociology, History)

RESEARCH QUESTIONNAIRE - PAGE 5

2.2 The development of an understanding of and appreciation for, concepts relating to the bio-physical environment.

In dealing with various aspects of the bio-physical environment, are the following concepts dealt with?

2.2.1 Ecosystems

Awareness, knowledge and understanding of the living and non-living world and their complex interactions.

2.2.2 Population

The social, economic, political and aesthetic influences on the environment of the populations of people.

2.2.3. Economics

The way in which economic forces affect development and therefore the environment.

2.2.4 Technology

The positive and negative ways in which man's technology has affected his environment.

2.3 The study of environmental problems and issues related thereto, at local, national and international levels.

Local?:

National?:

International?:

2.4 Fieldwork and/or practical work.

Do the students participate in fieldwork and/or practical work which relates to Environmental Education?
Is this fieldwork compulsory (C) or not (NC)?

RESEARCH QUESTIONNAIRE - PAGE 6

2.5 Development of critical thinking and problem-solving skills.

2.5.1 Do any of your courses deal with the ANALYSIS of problems (in general) and the strategies that may be adopted in order to approach their solution? (i.e. The basics of problem-solving).

2.5.2 Do any of your courses deal with the ANALYSIS of local, national or international ENVIRONMENTAL problems, and the strategies that could be adopted in order to approach their solution?

2.6 Values clarification

Do any of the courses deal with values clarification? (Values education.) E.g. The reasons for holding specific values, and the effect of an individual's values on his behaviour?

SECTION B : THE DIDACTICS OF ENVIRONMENTAL EDUCATION

These questions are directed at departments dealing either with subject methodologies, or with background information of relevance to the teaching situation (e.g. Educational Psychology, Pedagogics).

SELECTED ELEMENTS FOR EE

Certain key elements have been identified as being of basic importance in the training of teachers for effective Environmental Education. Some of these may be of relevance to the work of your department others may not. If they are not of direct relevance please write N/A (Not applicable).

3.1 Training with regard to communication skills

Does your teaching programme deal with communication skills? (theory and/or practical).

RESEARCH QUESTIONNAIRE - PAGE 7

3.2 Training with regard to holistic teaching.

Does your teaching programme include training for inter-disciplinary or multi-disciplinary teaching?
(Inter : themes studied using information from different subjects.
Multi : linking subjects together)

3.3 Training in fieldwork and/or practical work.

3.3.1 Does your teaching programme allow for the training of students in the planning, management and execution of fieldwork and/or practical work? (Please give details).

3.3.2 Does your department give training in the preparation of study materials including fieldwork worksheets? (Please give details)

3.4 Training with regard to the learning milieu

(This question may only apply to subjects such as Educational Psychology and/or Sociology but might well apply to subjects such as Geography or History).

Does your teaching programme cater for training with regard to:

3.4.1 Pupil motivation

3.4.2. Management of pupil discussions (group dynamics)

3.5 The setting of aims and objectives

Does your programme include training in the setting of realistic aims and/or objectives for short and/or long term periods?

RESEARCH QUESTIONNAIRE - PAGE 8

3.6 Values clarification

a) Does your programme deal in any way with theories relating to the development of values in individuals? (i.e. values clarification).

b) Are your students trained in dealing with values clarification with school pupils?

3.7 Teaching practice

Are your students obliged in any way to teach one or more lessons relating to Environmental Education during teaching practice?

3.8 Contact with EE bodies or organisations

Does your department have contact with organisations concerned with EE? (Such as the Wildlife Society of Southern Africa or the (British) Council for Environmental Education).

3.9 Evaluation

How are your present courses/programmes evaluated?

4. ADMINISTRATIVE CONSIDERATIONS

Certain administrative considerations are considered important for the smooth functioning of effective EE programmes.

4.1 Does the college have a person with the part time or full-time function of co-ordinating EE at the college?

4.2 Does your department have communication with other departments with regard to approaches or possible co-operation regarding "common-ground" topics? (In any areas, not just EE).

4.3 Does your department co-operate with other departments with regard to particular programmes or events? (E.g. Art exhibitions, World Environment days, Nature Conservation).

APPENDIX D

ENVIRONMENTAL EDUCATION AT TREVERTON SCHOOL

Introduction

Treverton School is in Mooi River, Natal. The School is in the Midlands of Natal and lies on the banks of the Mooi River, a major tributary of the Tugela.

In 1980 the School embarked upon an experimental education programme involving the Standard 5 classes. The experimental programme, which involved an environmental studies approach to general education, has now been accepted as part of the primary school curriculum.

The basic aim of the environmental studies programme is given by the school principal as "to enable the pupils to think reasonably ... about their environment, and to see patterns of cause and effect which make sense."

As far as can be ascertained the Treverton programme is unique in South Africa. It is seen as a programme which could serve as a working model for the development of other programmes. For this reason it has been included in the the appendixes of this work.

1. The Environmental Studies Programme

The Standard 5 class are involved with a full time environmental studies programme at Treverton.

In a typical week the pupils have "normal" school on Mondays and Fridays, (during which time basic studies such as mathematics and the languages are stressed), while on other days they are engaged with field studies or the consolidation of information gained during field studies.

The Standard 5 classrooms are located away from the rest of the school. They lie in an area which is being developed as an Environmental Education Centre. In addition to the two classrooms there is a resource centre (with study specimens, maps, pictures and other materials) and a workshop (for model building and other "rough" work). A interpretive trail has been laid in the grounds and there is a study pond and aviary.

2. The fieldwork programme

The focus of study for the programme is the Mooi River basin. Through a number of field studies, (usually eight major and several minor field trips in a year) the pupils study aspects of both the bio-physical environment and the cultro-economic environment. They work in such diverse environments as the Giant's Castle Nature Reserve, Zululand, Mooi River Town and Durban harbour.

Different aspects of the work are stressed during each field trip. One field trip may emphasise geology, another plant ecology, another wildlife management, while yet another transportation systems.

During field trips information is obtained through talks, study-guides, experimentation and observation. Each pupil keeps a field note book which is a source of reference during the write-up stage of the study. The pupils work in groups of 4 to 5. The group composition usually remains unaltered throughout the year.

3. Consolidation

At the completion of each field trip the pupils spend time (usually one or two weeks) consolidating their information. They work in their groups, consulting their teacher or reference materials from the school library or the resource centre.

"Talk-backs" are conducted during which time all members of the class report on a particular aspect of the study. The use of audio-visual aids is encouraged at this time. Marks are allocated to each pupil for his/her talkback.

Each pupil writes up his/her notes in the form of an assignment in a special notebook. Marks are allocated for each assignment.

4. Inter-disciplinarity

The Standard 5 class teachers pay particular attention to the contents of the various Standard 5 syllabuses. During field trips the teachers ensure that the pupils develop skills and knowledge from all school disciplines. (For example mathematical measurements and calculations, scientific experiments and map drawing,) Where it is not possible to cover syllabus work during field trips (e.g. European studies in Geography) this work is covered in Standard 6.

5. The Treverton Programme and the "Eeco-teacher" concept.

In this thesis the concept of an "Eeco-teacher" (environmental Education Co-ordinator) was discussed. The two most important functions of the Eeco-teacher are firstly to ensure that Environmental Education is a basic aim of the school curriculum, and secondly to ensure that sufficient Environmental Education is included in classwork throughout the school to realise this aim.

Although Treverton does not have an Eeco-teacher as such, the senior Standard 5 teacher (who happens to be the vice-principal of the school) performs many of the functions of an Eeco-teacher that were suggested in this study.

It appears that in the future the senior Standard 5 teacher will assume more and more the role of the Eeco-teacher as envisaged in this thesis.

APPENDIX E

EXERCISES INVOLVING VALUES CLARIFICATION

Educational objectives seek to bring about change in the psychomotor, cognitive or affective domain. Psychomotor objectives relate to manipulative skills, while cognitive objectives relate to the acquisition of facts and involve recall and understanding. The affective domain is concerned with attitudes, interests, values and beliefs. A change in the affective domain is an internal activity and must be voluntary. It is usually more difficult to measure than changes in the psychomotor and cognitive domains.

Values education is to do with the affective domain. Through values education one tries to clarify relationships between phenomena, and to encourage the learner to review his attitudes and values.

An exercise in values clarification consists of a number of progressional steps. These are:

1. Stating the current value held.
2. Giving the reasons for the current value held.
3. Assessing the consequences of the values held.
4. Considering alternative values.
5. Assessing the consequences of the alternatives.

EXAMPLES OF VALUES CLARIFICATION EXERCISES FOR STUDENT TEACHERS

A. DEVELOPING AN APPRECIATION OF THE PROBLEM OF SMOKE EMISSIONS

Current value held: All industrial smoke emissions are bad.

Reasons for holding values: Prejudice from popular press.

Consequences: : Unreasonable attitude towards all smoke emissions.
: Belief that all smoke emissions should be stopped.

Alternative values : Smoke is a necessary part of the industrial process.
: If treated, smoke does not pollute the atmosphere unduly,

Consequences : Tolerance for smoke emissions.
: Lobbying for strict legislation on the treatment of smoke.

B. DEVELOPING AN AWARENESS OF SOUTH AFRICA'S WATER SUPPLIES

Current values held : Every family is entitled to a swimming pool.

Reasons for holding value : Own social circumstances.
: Perception of water availability.

Consequences : Accept swimming pools

Alternative values: South Africa is critically short of water.
: Family pools use water unnecessarily.

Consequences : Question building of pools.
: Use public swimming pool.
: Lobby for controls on private pools.

Topics which are suitable for values clarification exercises with student teachers include:

- Developing an understanding of and an appreciation for "dangerous" animals such as spiders and snakes, and "problem" animals such as jackals and eagles.
- Developing an understanding of the use of insecticides and herbicides in farming.
- Considering the risks and benefits of different kinds of power production.
- Developing an awareness of the value of household garbage, and of the problems of garbage disposal.
- Developing positive attitudes towards community involvements for environmental improvement.

VALUES CLARIFICATION FOR PRIMARY AND SECONDARY SCHOOL PUPILS

Values education is important at all levels of education. The following topics are suitable for school pupils.

A. JUNIOR PRIMARY SCHOOL

- Developing an awareness of the value of predators in an ecosystem.
- Developing an awareness of the value of insects.
- Showing the effect of family traditions on the things that we do. e.g. Open fires for Sunday barbecues.
- Conserving electrical energy through our own actions.
- Rating the things in our environment according to how useful they appear to us. e.g. trees, roads, air, flowers, telephone lines.
- Showing the relationship between life styles and the use of natural resources. e.g. Sunday drives in the counrty consuming fuel, disposable cutlery consuming plastics.

B. SENIOR PRIMARY SCHOOL

- Demonstrating the value of things that are apparently without value. (Clean air, open spaces, etc.)
- Analysing values held in connection with "dangerous" or"problem" animals. (Wolves, spiders, jackals, wild-cats).

- Identifying those characteristics of a community that pupils see as important.
- Examining the ways in which animals are portrayed in literature, and determining the images that these portrayals create in the minds of young people.
- Identifying priorities in a list of given values.
- Showing that values can be clarified by publicly affirming them.
- Making choices on environmental action. Deciding why the choices were made.

APPENDIX F

JOHANNESBURG COLLEGE OF EDUCATION

DEPARTMENT OF EDUCATIONAL STUDIES

ELECTIVE : ENVIRONMENTAL EDUCATION

COURSE CO-ORDINATORS : JOHN LEWIN
RALPH POHORILLE

COURSE OUTLINE

1. Developing a philosophy for Environmental Education.
1.1 Definition of terms
1.2 Aims and objectives of Environmental Education.
1.3 Study of philosophies relevant to Environmuntal Education.
1.3.1 Naturalism
1.3.2 Idealism
1.3.3 Pragmatism

2. Strategies for achievement of aims of Educational Education.
2.1 Learning theory as a basis for strategies.
2.2 The development of skills, attitudes and values in Environmental Education.

3. Designing an Environmental Education programme.
3.1 Consideration of existing syllabuses as a basis for the programme.
3.2 Designing the programme in the field.
3.3 Collecting and co-ordinating of resource material.

4. Implementation of programme

5. Evaluation of programme.
5.1 Designing methods for evaluation.